North Carolina Department of Transportation
Division of Highways
Statewide Planning Branch

ASHEVILLE URBAN AREA THOROUGHFARE PLAN

APRIL 1996

1994 THOROUGHFARE PLAN

FOR THE

ASHEVILLE URBAN AREA

Prepared By:

The Statewide Planning Branch
of the Division of Highways
of the North Carolina Department of Transportation

In Cooperation With:

The Ashevillve Urban Area Metropolitan Organization

The Federal Highway Administration
of the United States Department of Transportation

Persons Responsible for This Report:

Manager, Statewide Planning Branch:	Marion R. Poole, Ph.D., P.E.
Thoroughfare Planning Engineer:	Deborah Hutchings, P.E.
Project Engineer:	Kimberly Drew Hinton
Engineering Technician:	Jim Neely

April, 1996

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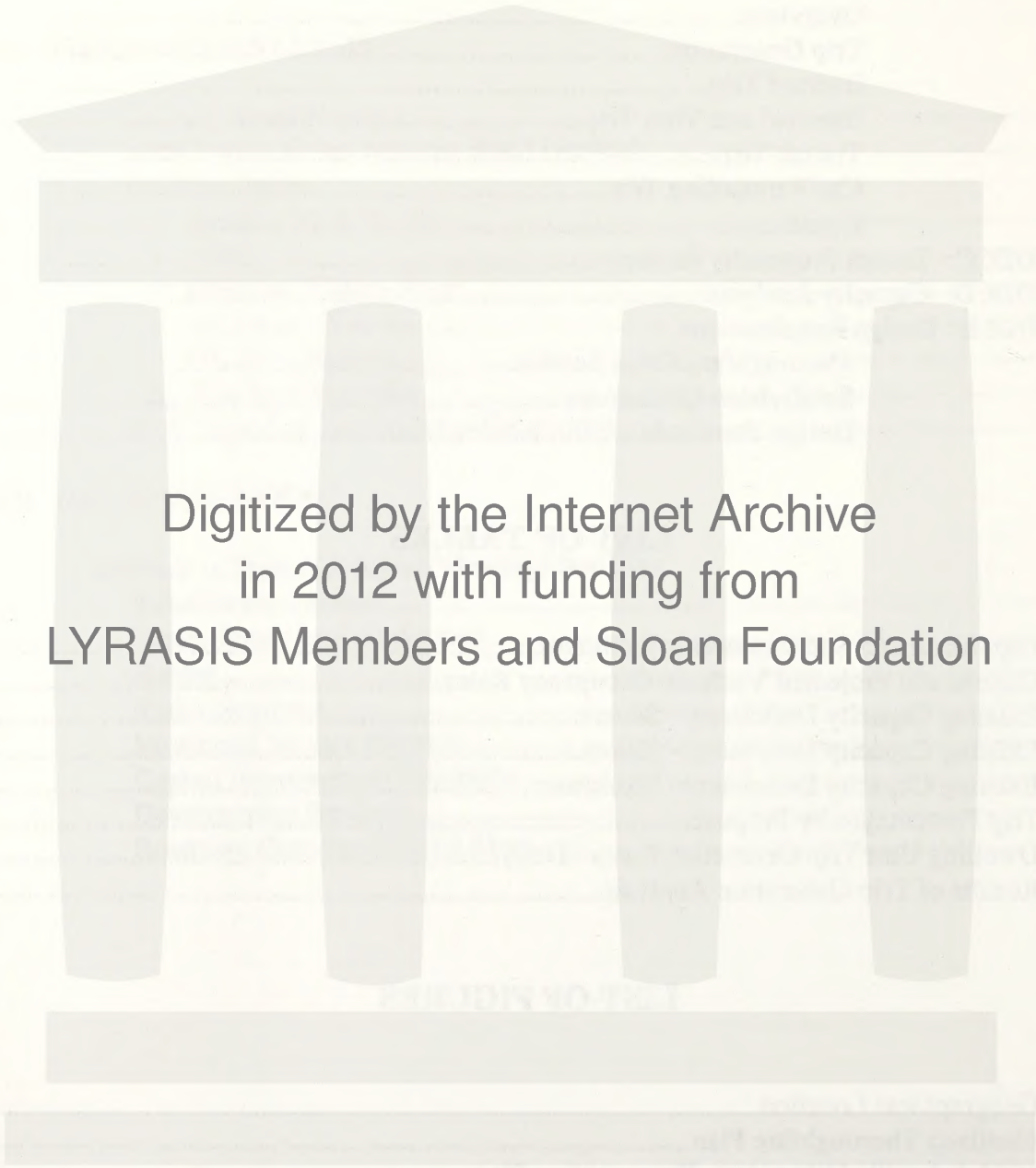


1. INTRODUCTION

This report describes the update of the Asheville Urban Area Thoroughfare Plan. The thoroughfare plan is intended to provide the State of North Carolina and the urban area guidance in the development of a transportation system sufficient for travel demands through year 2020. The Asheville Urban Area is nestled in the Smokey Mountains in the western part of the state. The urban area consists of the City of Asheville; the Towns of Biltmore Forest, Black Mountain, Fletcher, Montreat, Weaverville, and Woodfin; and most of Buncombe County. Figure 1 shows the Asheville area in relation to the rest of the State. The previous thoroughfare plan was adopted on January 6, 1975. Thoroughfare plan updates in urban areas are generally needed every five to ten years. The update to the Asheville plan began in 1989.

Transportation plays a vital role in the development of an area. The needs of business, industrial, and residential communities are supported by the transportation system. The purpose of a thoroughfare plan is to assess the needs of these communities and provide a safe, efficient, and economical transportation system for the present and future.

In this report, transportation encompasses various modes of transportation - single occupant automobiles, carpooling, transit, walking, and biking are all discussed and where appropriate, are a part of the solution to the various deficiencies in the area. The major emphasis is on improving the street network for automobile use as that is how the majority of travelers choose to meet their transportation needs.

The system of thoroughfares proposed follows the basic Principles of Thoroughfare Planning as described in Chapter 2 of the report. There are many benefits to be derived from thoroughfare planning. The primary objective is to enable major thoroughfares to be progressively developed that will adequately service future traffic demands. The location of thoroughfares depends on field investigation, aerial photos, existing and anticipated land uses, and topographic conditions. It also considers the travel concerns of the community and its public representatives.

Major benefits to be derived from thoroughfare planning are:

(a) A minimum amount of land will be required for street and highway purposes.

(b) Local citizens will be aware of the streets which will be developed as major thoroughfares and thus will have assurance that their residential street will not become a major traffic carrier.

(c) Land developers can design their subdivisions so that subdivision streets will function in a safe and efficient manner.

It should be emphasized that the thoroughfare plan is based on anticipated growth and current trends of the planing area. Actual growth rates and patterns may differ somewhat from

those logically anticipated. Prior to construction of specific projects, a more detailed study will be required to reconsider development trends, specific locations, design requirements, and environmental needs.

Due to the geographical configuration of the area and distance, separate plans were completed for Black Mountain/Montreat and Weaverville. These plans were adopted on March 11, 1991 and April 9, 1991 respectively. Separate reports were also done for each of the areas.

Finally, the public and environmental agency input that has gone into the update of this thoroughfare plan has been thorough and extensive. The Asheville Urban Area is especially noted in North Carolina for its commitment to public involvement. In addition, as part of this thoroughfare plan, a pilot project effort with the Federal Highway Administration to improve current environmental planning processes was done. The report titled, Phase I Environmental Analysis Approach, for the pilot project is available from:

Asheville Planning Department
Post Office Box 7148
Asheville, NC 28802

GEOGRAPHIC LOCATION
FOR
ASHEVILLE MPO
NORTH CAROLINA

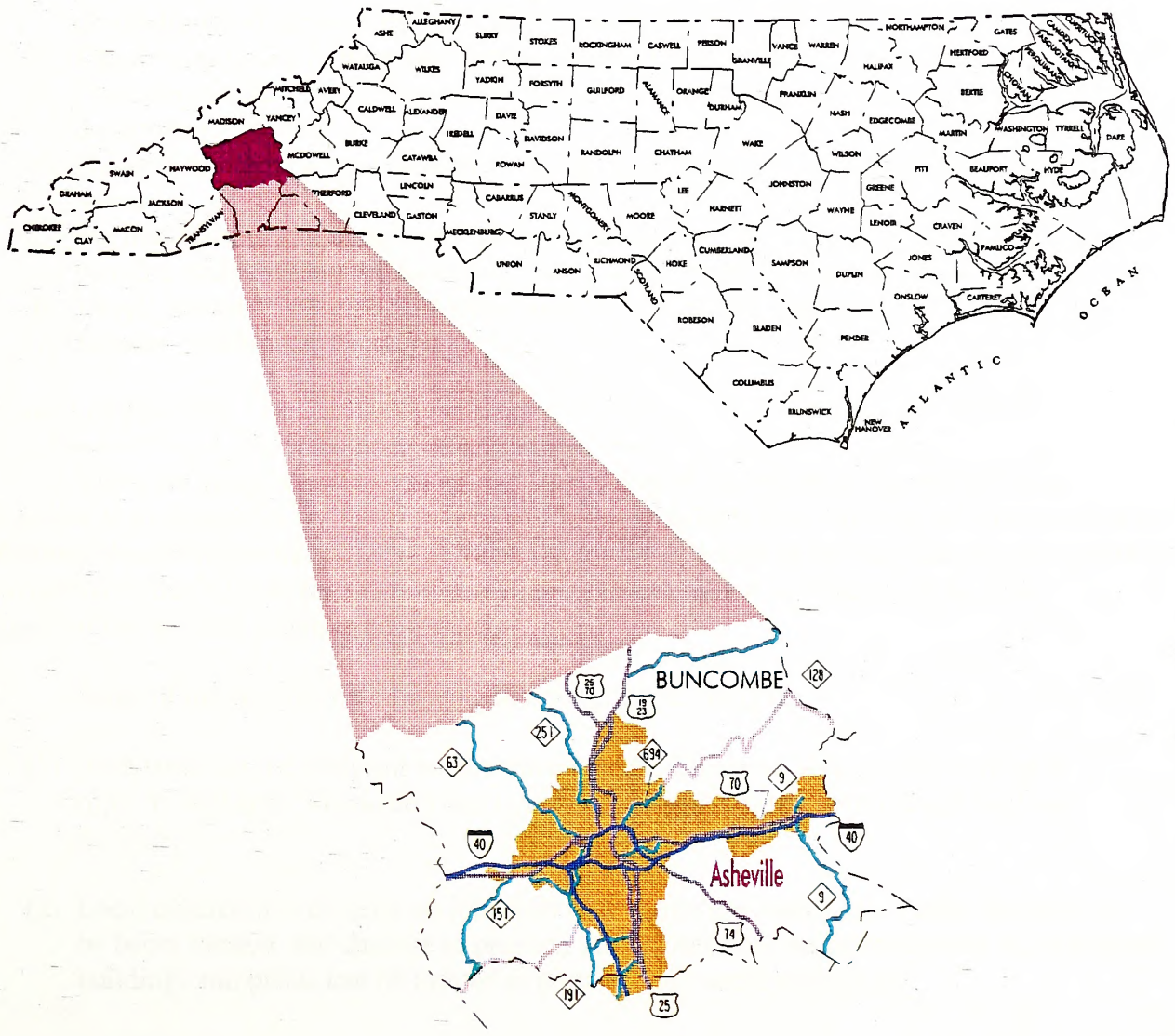


FIGURE 1

2. THOROUGHFARE PLANNING PRINCIPLES

This chapter explains the basic principles and the purpose of transportation planning. System and operational efficiency are also defined. Finally, the idealized thoroughfare plan system is described.

Basic Principles

The urban street system typically occupies 25 to 30 percent of the total developed land in the urban area. Since the system is permanent and expensive to build and maintain, much care and foresight are needed in its development. Thoroughfare planning is the process used by public officials to assure the development of the most logical and appropriate street system to meet future travel desires. The major steps involved in the thoroughfare planning process are:

(1) **Collection of data** concerning existing physical development and travel desires (origin, destination, and mode of travel) within the area.
(2) **Development of a (computer) model** which reflects present travel desires.
(3) **Prediction of future socioeconomic data,** and computation of future travel desires using the computer model.
(4) **Evaluation** of the adequacy of the existing street system in serving present and future travel.
(5) **Formulation of the best thoroughfare plan**, on the basis of travel demand, economic benefits, and environmental considerations, to meet future travel desires.
(6) **Development of construction priorities** for plan implementation.
(7) **Implementation** of the plan.

Purpose of Planning

There are many benefits to be gained from thoroughfare planning, but the primary objective is to assure that the street system will be progressively developed in such a manner as to adequately serve future travel desires. Thus, the cardinal concept of thoroughfare planning is that provisions be made for street and highway improvements so that as needs arise, feasible opportunities to make improvements exist.

Some of the benefits derived from thoroughfare planning are:

(1) Each street can be designed to perform a specific function. This permits savings in right-of-way and construction costs, and encourages stability in travel and land use patterns.

(2) Local officials and citizens are informed as to future improvements. Public facilities can be better located, and damage to property and appearance can be minimized (for example: buildings and plants can be located to permit future street widening).

(3) Residents will know which streets will be developed as major thoroughfares and be able to make an informed decision when choosing a home.

(4) City officials will know when improvements will be needed and can schedule funds accordingly.

Efficiency

The improvement of the efficiency of existing facilities can be achieved through the improving of the **system** and **operational efficiency** of thoroughfares.

System efficiency can reduce travel distances, time, and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Functional Classification - Streets perform two primary functions - they provide **traffic service** and **land service.** These two functions are basically incompatible. The conflict is not serious if both traffic and land service demands are low, but when traffic volumes are high, conflicts created by intense land service demands result in **congestion.**
The thoroughfare plan provides a functional system of streets which permits travel with directness, ease, and safety. Different streets in the system are designed to perform specific functions thus minimizing the traffic and land service conflict. Figure 2 illustrates the relationship between traffic service and land service. Streets can be categorized as: local access streets, minor thoroughfares or major thoroughfares.

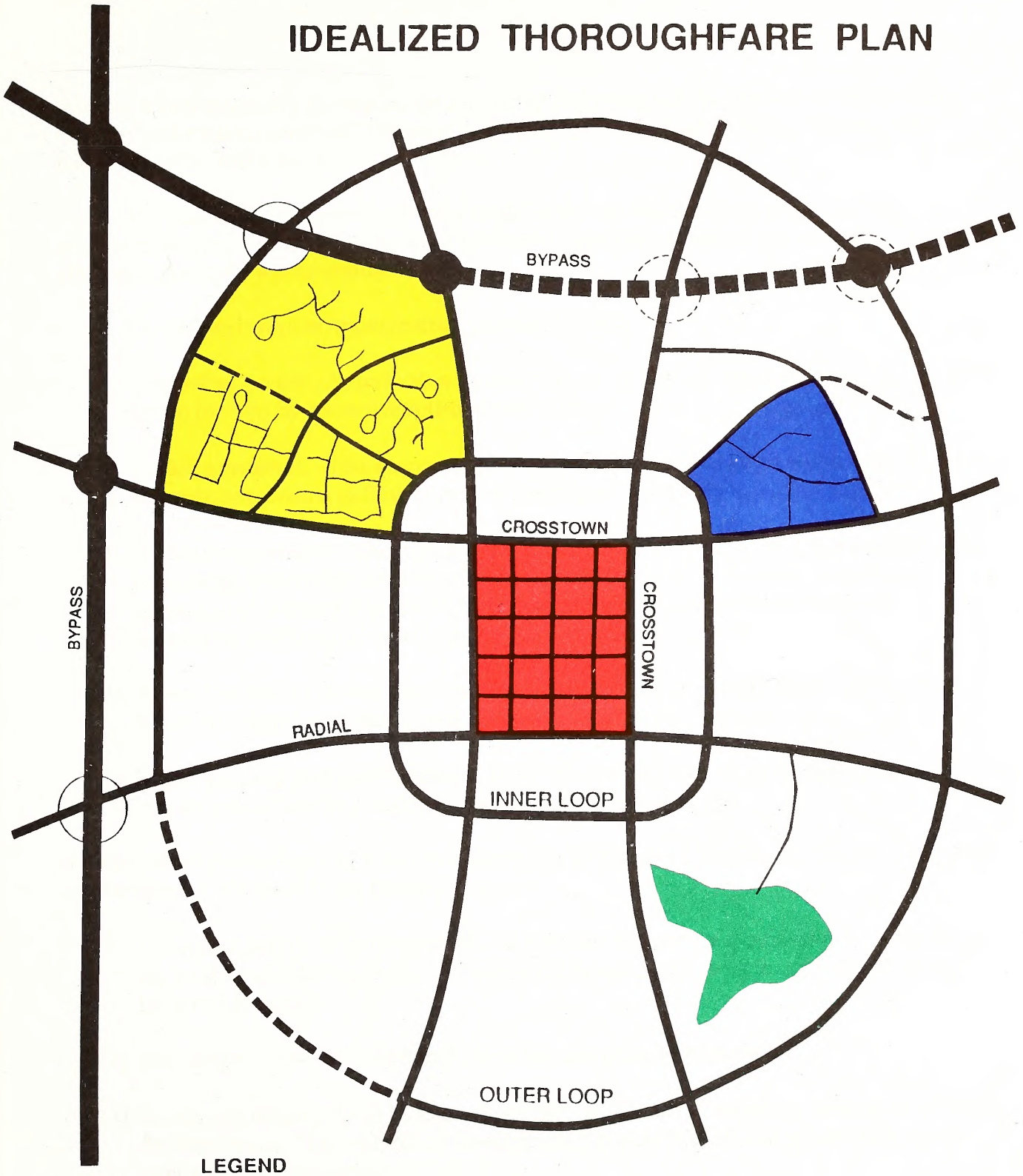
Local Access Streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins or destinations on the streets would be served. **Their function is to provide access.** Depending upon the type of land use which they serve, local access streets may be further classified as residential, commercial, and/or industrial.

Minor Thoroughfares are important streets in the city system. They collect traffic from local access streets and carry it to the major thoroughfare system. They may, in some instances, supplement the major thoroughfare system by aiding minor through movements. A third function which may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major Thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and inter-city traffic. Streets which comprise the major thoroughfare system should not serve abutting property. **Their major function is to carry traffic.** Major thoroughfares may range from two lane streets to expressways with six or more traffic lanes. As a general rule, parking should not be permitted on major thoroughfares.

Operational Efficiency increases the capability of the street to carry vehicular traffic and people. In terms of vehicular traffic, a street's **capacity** is defined as "the maximum number of

IDEALIZED THOROUGHFARE PLAN



LEGEND

	EXISTING	PROPOSED
AJOR THOROUGHFARE REEWAY		
AJOR OTHER		
NOR THOROUGHFARE		
OCAL ROAD		
TERCHANGE		
RADE SEPERATION		

LAND USES

- COMMERCIAL/BUSINESS
- RESIDENTIAL
- INDUSTRIAL
- PUBLIC/INSTITUTIONAL

FIGURE 2

vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions." Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include street widening, intersection improvements, improving the vertical and horizontal alignment, eliminating road-side parking and eliminating property access points.

Operational ways to improve street capacity include:

(1) **Control of access** - A roadway with complete access control can carry over two times the traffic handled by a non-controlled access street.

(2) **Parking removal** - Increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking operations.

(3) **One-way operation** - The capacity of a street can be up to 50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

(4) **Reversible lanes** - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

(5) **Signal phasing and coordination** - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

(1) Encourage people to form carpools and vanpools for work and other trips. This reduces the number of vehicles on the roadway while increasing the people carrying capability of the street system.

(2) Encourage the use of mass transit, bicycles, and pedestrian travel.

(3) Encourage industries and business to stagger work hours or establish variable work hours for employees. This will reduce travel demand in peak periods and spread peak travel over a longer time period.

Idealized Thoroughfare
Plan System

A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system which is most adaptable to desired lines of travel within an urban area and which permits movement between various areas of the city with

maximum directness is the radial-loop system. This system consists of several functional elements--radial streets, crosstown streets, loop system streets, and bypasses. An idealized thoroughfare plan showing the described facilities is also included in Figure 2.

Radial streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of **crosstown streets** which form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other to follow the area's border and allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area, and they are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A **bypass** is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing from it traffic which has no desire to be in the city. Bypasses are usually designed to through-highway standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Application of Thoroughfare
Planning Principles

The above descriptions are of an idealized major thoroughfare system. In actual practice, thoroughfare planning is done for established areas and is constrained by existing land use and street patterns, topography, public attitudes, and expectations of future land use. Compromises must be made because of these, and other factors that may affect major street locations.

3. THE 1994 ADOPTED THOROUGHFARE PLAN

This chapter will discuss the recommendations for the adopted thoroughfare plan and the travel service of each corridor as it relates to the entire system of roads. The 1994 Adopted Thoroughfare Plan is shown in Figure 3. Facility type explanations are found in Chapter 2 - Thoroughfare Planning Principles.

Special Note

There are several challenges associated with this thoroughfare plan. The thoroughfare plan has an inadequate major and minor street system due to the mountainous topography. A lot of the minor streets have substandard road widths. The crosstown system needs to be improved. There is not enough crosstown facilities to move traffic around the central area. There is only one parallel radial system with direct access into the central business district (CBD) from south Asheville. And, there are areas of congestion not solved in this thoroughfare plan.

The 1975 Asheville plan presented CBD schemes in addition to recommendations from the earlier 1961 study completed by Wilbur Smith and Associates. The objectives for the CBD schemes were: (1) to reduce or eliminate thru traffic coming into the CBD, (2) to make the CBD more conducive to pedestrian traffic, (3) to create a shopping district safer for pedestrians, and (4) reduce accidents within the CBD. The CBD recommendations were eliminated from this 1994 Thoroughfare plan. This was due partly because of the historic evolution in the CBD.

Seven focus areas in the Asheville Urban Area are I-40 access into the south CBD, Amboy Road\Meadow Road, Biltmore Avenue\McDowell Street, Historic Biltmore Village (see Biltmore Avenue and Liberty Street/Crayton Road), Hillard Street, Merrimon Avenue and Patton Avenue downtown. These areas will not be solved by full implementation of the thoroughfare plan. See each area listed below for more details.

FREEWAYS

Future I-26 Corridor

The Future I-26 corridor will extend from the North Carolina/Tennessee State line on new and existing location to existing I-26 south of I-40 in Asheville. The new freeway will become a primary route to the west and the northeast regions of the United States. The project is being constructed in several sections.

This corridor will be the only north-south freeway in the Asheville Urban Area. It will run the entire length of the Asheville Urban Area from the northern planning boundary to the southern planning boundary. It will run along existing US 19/23/70, I-240, and I-26 with a short new

location project. The new location project, termed Asheville Connector, extends from US 19/23/70 to I-240.

The Asheville Connector was included in a pilot project to select a preferred corridor for this area. *The Phase I Environmental Analysis Approach: Alternatives Analysis for the Asheville Urban Area Corridor Preservation Pilot Project* documents this work.

The Asheville Connector is recommended to be a 4 lane facility. It will reduce traffic on the Smokey Park Bridge. The Smokey Park Bridge today is experiencing capacity problems from the weaving and merging of lanes coming out of the two large interchanges at both its ends. *The Phase I Environmental Analysis* also recommends widening the Smokey Park Bridge from 8 to 12 lanes and I-240 from US 19/23/70 to I-40/I-26 from 4 to 6 lanes. These recommendations are being analyzed in the Transportation Improvement Program project #I-2513.

I-40

I-40 provides major travel service to the area. I-40 is the only west-east freeway in the Asheville Urban Area. It runs the entire length of the Asheville Urban Area from the western planning boundary to the eastern planning boundary.

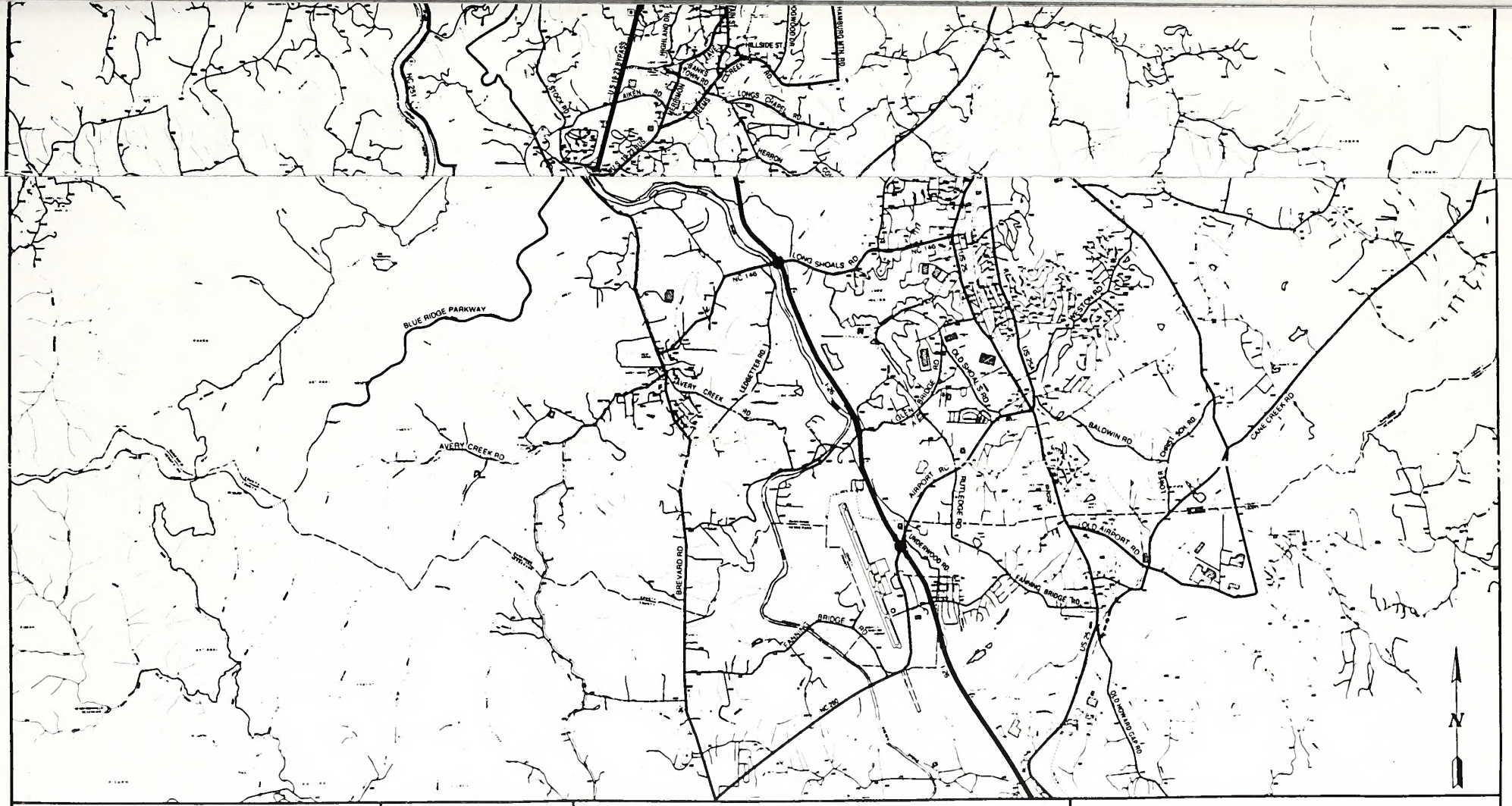
It is important economically to keep the travel service on I-40 adequate for the Asheville Urban Area as well as for the State. I-40 will be near its practical limits for a 4 lane freeway by the year 2020. I-40 will then need to be widened to a 6 lane freeway.

I-40 will be needed ultimately to directly access the south CBD of Asheville. A connection is needed between the Brevard Road (NC 191) interchange and the Hendersonville Road (US 25) interchange. The distance between the two interchanges is about 4 miles. Providing this link into the south CBD would help alleviate congestion on the Smokey Park Bridge, Biltmore Avenue\McDowell Street, Haywood Road and the Historic Biltmore Village.

This connection is addressed in the *Phase I Environmental Analysis Approach* as Alternative R in Problem Area #1. Alternative R was not selected as a preferred corridor because of environmental, social, cultural, and historic impacts. Although long term benefits make it a viable project, the Asheville Metropolitan Planning Organization's (MPO) Transportation Advisory Committee (TAC) and the Technical Coordinating Committee (TCC) eliminated this alternative from the thoroughfare plan..

I-240

Today I-240 makes a loop system with I-40 around the heart of Asheville. (The section from Charlotte Street to east I-40 was proposed on the 1975 Thoroughfare Plan.) I-240 carries heavy volumes of traffic of both local and through trips. This is a consequence of an inadequate



ASHEVILLE URBAN AREA THOROUGHFARE PLAN

SEPTEMBER 29, 1994

BUNCOMBE COUNTY

NORTH CAROLINA

Prepared by the
North Carolina Department of Transportation
Division of Highways-Statewide Planning Branch
in cooperation with
U.S. Department of Transportation
Federal Highway Administration

0 2000 4000 6000 8000

SCALE IN FEET

LEGEND

FREEWAY

MAJOR THOROUGHFARE

MINOR THOROUGHFARE

INTERCHANGE

PLANNING BOUNDARY

ADOPTED BY:

CITY OF ASHEVILLE

TOWN OF BILTMORE FOREST

TOWN OF FLETCHER

TOWN OF MONTREAT

BUNCOMBE COUNTY

PUBLIC HEARING

PLANNING

APPROVAL BY TAC

REVISIONS :

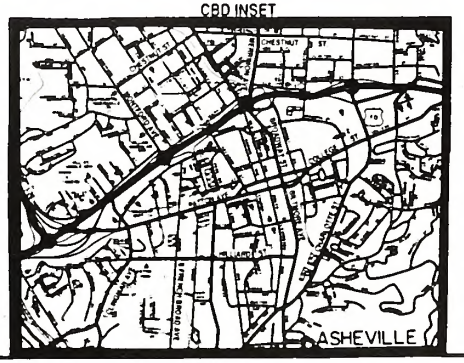
TAC	ASHEVILLE	BILTMORE FOREST	FLETCHER	MONTREAT	BUNCOMBE COUNTY	PUBLIC HEARING	NCDOT

NOTE 1:

NOTE 2:

FIGURE 3

CBD INSET



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I-240

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SEPTEMBER 29, 1994

BUNCOMBE COUNTY

NORTH CAROLINA

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U.S. Department of Transportation
Federal Highway Administration

LEGEND

ADOPTED BY

REVISIONS :

CBD INSET

ASHEVILLE

FIGURE 3

major and minor street system. The street system has developed this way because mountain topography has limited street improvements financially and environmentally.

I-240 from US 19/23/70 to I-40/I-26 is part of the Future I-26 Corridor. This portion will be redesignated as I-26 once the entire corridor is upgraded to interstate standards (see Future I-26). I-240 from I-40/I-26 to Chunks Cove Road is recommended to be improved to a 6 lanes.

US 19/23/70

US 19/23/70, extending north from I-240, functions as a major radial. It runs from the northern planning boundary to the CBD in Asheville. It serves mostly through trips. Like the portion of the I-240 loop, US 19/23/70 will be redesignated as I-26 once it is upgraded to interstate standards (see Future I-26). This project is listed in the Transportation Improvement Program as #A-10.

MAJOR THOROUGHFARES

Amboy Road/Meadow Road/Swannanoa River Road

These roads make up a crosstown facility between I-240 and US 70. This facility transverses the middle of the planning area south of the CBD. It also parallels and is located north of I-40.

Amboy and Meadow Road will become an important connection from the west side of Asheville into the heart of Asheville and the Medical Complexes on Biltmore Avenue and McDowell Street. Amboy Road will continue to grow in importance as congestion increases on the Smokey Park Bridge.

Swannanoa River Road near US 74 south of the Asheville Mall will continue to grow with commercial development. It functions more as a radial by carrying traffic from the Swannanoa community into Asheville.

Recommended improvements to Amboy and Meadow Roads are widening from 2 to 4 lanes. Although future year 2020 traffic projections on Swannanoa River Road imply no improvements are needed, this facility should be upgraded to design standards with turn lanes, where applicable. It should also be monitored for increasing developmental growth.

Biltmore Avenue

Biltmore Avenue serves as a major north-south facility between the CBD and the Historic Biltmore Village District with McDowell Street (see McDowell Street). The area near Biltmore

Village will have severe congestion in the design year, especially near the Historic Biltmore Estate's only entrance.

Biltmore Avenue has costly structures and historic properties near the Medical complexes and Historic Biltmore Village District. Widening of Biltmore Avenue is not recommended because of the dense development in the area; although there is a feasibility study (TIP# U-3404) analyzing the possibilities of widening. A modified one-way pair with McDowell Street is recommended when congestion becomes more severe.

The modified one-way pair would begin at Southside Avenue and end at Lodge Street. The pair would have 3 through lanes in one direction and 1 through lane in the other direction. The modification would allow emergency vehicles the same access they currently have..

The modified one-way concept was studied in the *Phase I Environmental Analysis Approach.* Further study would be needed and input from the hospitals, police, fire department sought before implementation.

Blue Ridge Parkway

The Blue Ridge Parkway is a major scenic highway for the State of North Carolina. It extends from well inside Virginia and runs along the ridges of the Appalachian Mountains. The United States Department of Interior - National Park Service maintains the parkway. There are no recommended improvements to the parkway.

Brevard Road (NC 191)

Brevard Road serves southwest Asheville's traffic. It is a major radial which extends from I-40 to the southern planning boundary and parallels most of I-26. The Pisgah National Forest is predominantly on the west side of Brevard Road. Yet Brevard Road still has increasing development in South Asheville.

Recommended improvements are for widening to multi-lanes, a minimum of 4 lanes, and keeping the integrity of the environment. Brevard Road has many challenges in regards to widening. There are established rural communities, the Blue Ridge Parkway overpass bridge, the French Broad River which parallels a section of Brevard Road, and the Pisgah National Forest. A feasibility study has been placed in the TIP under project #U-3403. (See Minor Thoroughfares.)

Cane Creek Road and Extension

Cane Creek Road is a radial in the fletcher area. It provides access from US 25 to US 74. The extension would extend Cane Creek Road to Old Howard Gap Road.

Charlotte Street

Charlotte Street is a north-south crosstown facility. It runs from Biltmore Avenue to Kimberly Avenue, and is designated a major thoroughfare from Biltmore Avenue to I-240. This section of Charlotte Street was constructed based on the 1975 Thoroughfare Plan. Charlotte Street from College Street to Orchard Street is somewhat inadequate to handle projected traffic. The inclusion of turn lanes at key places should handle projected traffic along this small section. This may require the overpass bridge of I-240 to be replaced.

Clingman Avenue/Haywood Road

Haywood Road runs southwest to northeast from I-40 to south of the CBD. Haywood Road becomes Clingman Avenue after the French Broad River crossing and enters the CBD.

Clingman Avenue was on the 1975 Thoroughfare Plan. It is adequate in handling projected traffic, but Haywood Road from Ridgelawn Road to Patton Avenue (US 19/23 Business) is not. This section of Haywood Road was once a main street in the former City of West Asheville. There are buildings close to this 2 lane road. With 2020 traffic projections approaching 24,000 ADT, this section will need to be a 4 lane facility. This can be achieved by removing the parking on both sides of the road.

This recommendation is not favorable with the City or the community. They feel the character and integrity of the area will be lost. Therefore a parking removal or replacement study and a corridor traffic analysis looking into alternative corridors and modes will be required when traffic congestion becomes unacceptable to the City and community.

The section of Haywood Road (US 19/23) from I-40 to Patton Avenue is not as constrained. Recommended improvements are widening to a 6 lane facility.

Hendersonville Road (US 25)/Sweeten Creek Road (US 25A) and Sweeten Creek Extension

Hendersonville Road and Sweeten Creek Road are two major parallel north-south radials. They extend from Biltmore Village to the southern planning area and serve South Asheville and Fletcher. Sweeten Creek Road merges with Hendersonville Road at Airport Road.

Hendersonville Road is the only route into the southern CBD by way of I-40. There is a proposed interchange at I-40 and Sweeten Creek Road (TIP# I-100).

Hendersonville Road carries two thirds of the total traffic on both facilities. This traffic load on Hendersonville Road will even out once Sweeten Creek Road is widened as part of TIP project #R-2801. Hendersonville Road from I-40 to Airport Road will be adequate for future year 2020 traffic.

Hendersonville Road will experience capacity problems at its ends in the future year 2020. Hendersonville Road from I-40 to Meadow Road in the Biltmore Village is very crucial. This section is attractive because of the Historic Biltmore Estate entrance, the shopping at Biltmore Village, the medical complexes north of Biltmore Village, and access to the CBD.

The proposed interchange at I-40 and Sweeten Creek Road will be the impetus necessary to attract traffic from Hendersonville Road. The Sweeten Creek extension will provide a short bypass around the Historic Biltmore Estate entrance and Biltmore Village onto Swannanoa River Road. However this section of Hendersonville Road will still experience operational problems even with these improvements in the future year 2020.

Hendersonville Road from Sweeten Creek Road at Airport Road to the southern planning boundary also will need improvement. This is addressed in the *Phase I Environmental Analysis Approach* study. Recommended improvements from this study propose widening the existing roadway to a 5 lane curb and gutter facility.

Hillard Street

Hillard Street is a major thoroughfare and crosstown facility in the south CBD. A proposed one-way pair with a new road on new location was presented in the 1975 Asheville Recommended Plan. The major objective in the 1975 Plan was to reduce or eliminate thru traffic coming into the CBD. Since this time several buildings have become historic and the City of Asheville has built a new Public Works facility in its corridor. The new location pair was deleted from the 1994 Asheville Urban Area Thoroughfare Plan by the TAC and TCC.

Long Shoals Road (NC 146)

Long Shoals Road links Hendersonville Road (US 25) to I-26 and Brevard Road (NC 191) in the southern Asheville area. It is an east-west facility with a heavy concentration of residential land uses, schools, and an expanding industrial park. Long Shoals Road is to be widened to a multi-lane facility with TIP project #R-2813.

Lyman Avenue and Extension/Riverside Drive (NC 251)

Lyman Avenue and its extension with Riverside Drive can be considered a north-south radial facility from the northern planning boundary to the heart of Asheville. There are no improvements needed on Riverside Drive from Broadway Street to Lyman Avenue. Riverside Drive from Broadway north to the planning boundary and Lyman Avenue will need to be upgraded.

McDowell Street (US 25)

McDowell Street is a radial which parallels Biltmore Avenue and is a continuation of the service provided by Hendersonville Road and Sweeten Creek Road. McDowell Street is similar

in nature to Biltmore Avenue. It also serves a variety of traffic including medical, commercial, residential and institutional.

McDowell Street does not have the constraints that Biltmore Avenue has except from the Victoria Road tunnel to the viaduct. This section would need to be widened to a five lane facility or converted to a modified one-way pair (see Biltmore Avenue) due to increased congestion.

Merrimon Avenue (US 25)

Merrimon Avenue is another major radial in the northern half of the study area. It serves dense residential development with some historic properties, heavy strip commercial development, the outlying areas of Woodfin and Weaverville, and the University of North Carolina at Asheville.

Merrimon Avenue is currently a heavily congested road. Traffic is expected to become even more congested by the design year 2020 as development continues. Charlotte Street, Kimberly Avenue, Broadway Street, and W.T. Weaver Boulevard experience diverted traffic from Merrimon Avenue. Later Elkwood Avenue and Lakeshore Drive will experience the impacts of traffic diverted from Merrimon Avenue in order to avoid the congestion at Beaver Lake.

It is not feasible to widen Merrimon Avenue its entire length because of the nature of the road. Spot widening at some intersections to add turn lanes may be achievable. *The Phase I Environmental Analysis Approach* recommends a traffic management system of reversible lanes to be studied later. The reversible lanes would start from Beaverdam Road and end at I-240. This solution does not address the area near Beaver Lake.

Northwest Connector

The Northwest Connector is a major thoroughfare which accompany's the Asheville Connector in alleviating congestion on the Smokey Park Bridge. *The Phase I Environmental Analysis Approach* report recommends this corridor in conjunction with the Asheville Connector. The Northwest Connector will be needed by the end of the design year 2020.

The Northwest Connector runs through an undeveloped portion of northwest Asheville. Its design should fit in with the character of the area by minimizing cut and fill.

The Northwest Connector provides a more direct link to the CBD and the Interstate system for northwest Asheville. It is recommended this facility be a fully controlled access parkway with 4 lanes.

Old Airport Road

Old Airport Road is in a growing industrial area in the Town of Fletcher. Recommended improvements are widening to a 4 lane urban facility.

Patton Avenue

Patton Avenue exists as a major radial with the section of Haywood Road from I-40 to Johnston Boulevard. This facility serves west Asheville to the CBD. It has major capacity deficiencies. Signal Optimization is recommended for relieving congestion on Patton Avenue downtown.

West Patton Avenue was also studied in the *Phase I Environmental Analysis Approach* as part of the Smokey Park Bridge problem area. Several options were explored in the environmental analysis to alleviate traffic on Patton Avenue. The options ranged from elevating ramps to elevating Patton Avenue itself to a new parallel facility. These options and others will be analyzed in the Transportation Improvement Program project #I-2513.

Riceville Road

Riceville Road is a major radial which serves the Swannanoa community. It is severely under design standards for the amount of future traffic proposed. Recommended improvements are to upgrade the facility to the design standards of a 2 lane road with 12 feet lanes.

Sardis Road (NC 112)

Sardis Road links the Enka community at US 19/23 to Brevard Road (NC 191) near I-26. This is a growing community. Recommended improvements are to a 5 lane curb and gutter facility.

US 19/23

US 19/23 with Haywood Road and Patton Avenue is a major radial from the southwest planning boundary to the CBD. US 19/23 serves the Enka community from the planning boundary to I-40. The Enka community is growing with residential and industrial land uses. Recommended improvements are widening to a 6 lanes curb and gutter facility.

Weaverville Highway (US 25)

Weaverville Highway is a continuation of the Merrimon Avenue radial from Elkwood Avenue to the northern planning boundary at Weaverville. It parallels Future I-26 (now US 19/23/70). This area has heavy strip commercial development and industrial land uses.

Recommended improvements are widening to a 4 lane curb and gutter section with turn lanes at key intersections. Special attention should be given to truck traffic.

Upgrades

There are several major thoroughfares which only need to be upgraded to achieve adequate design standards. In some instances this may be widening the facility a few feet or putting in turn lanes at key intersections or an intersection redesign. These facilities are Beaverdam Road, Mills Gap Road, and Tunnel Road.

TIP Projects

The major thoroughfares which follow will be brought to design standards with the Transportation Improvement Program (TIP). They are Broadway Street (U-1001A), Charlotte Highway - US 74 (R-2306), Hendersonville Road from US 25A to the southern planning boundary (R-2213), Leicester Highway (R-3301), NC 151 (R-2116). These improvements will take these facilities to the design year 2020.

No Improvements

There are several major thoroughfares which did not need improvement at the time of this study. These thoroughfares are adequate to serve the present and future traffic demands. They are Airport Road (NC 280), Asheland Avenue, Clingman Avenue, College Street, Erwin Hills Road, French Broad Avenue, Hillard Street, Lee Creek Road, Porter Cove Road, Ralph Street, Southside Avenue, Town Mountain Road, US 70 from US 74 to the eastern planning boundary, and W.T. Weaver Boulevard.

MINOR THOROUGHFARES

Brevard Road (NC 191)

This route changes from major to minor north of I-240. It extends to Haywood Road. Dense residential development lie on both sides of the road. Ideally, this facility would need to be widened before the design year 2020, but this may not be feasible. More study should be considered for this corridor. (See Major Thoroughfares.)

Charlotte Street/Edwin Place/Kimberly Avenue

Charlotte Street changes from a major to minor thoroughfare north of I-240 to Edwin Place. Strip commercial development lies along Charlotte Street. Recommended improvements are to upgrade this facility. (See Major Thoroughfares.)

Edwin Place is a connecting segment of Charlotte Street to Kimberly Avenue. It is a short connecting section. Kimberly Avenue has a dense residential community on one side and the Grove Park Inn on the other. Both facilities have 2 lanes with parking available.

Design year 2020 traffic estimates range from 18,000 to 22,000 ADT. This is mostly in part due to diverted traffic from Merrimon Avenue. These volumes warrant a 4 lane facility. This recommendation is not favorable with the city or the community. They feel the character and integrity of the area will be lost with this type of improvement.

Elk Mountain Road

Elk Mountain Road is one of the primary routes in the Town of Woodfin. This road is adequate in serving most future demands, but is severely damaged by truck traffic. Transportation Improvement Program project #U-401 will upgrade and improve Elk Mountain Road.

Haywood Street

Haywood Street is in the heart of the west CBD in Asheville. This 2 lane facility will be at practical capacity by the design year 2020. Although widening by way of parking removal is practical, this recommendation is not favorable with the city or the community. They feel the character and integrity of the area will be lost with this type of improvement. A parking study and signal optimization analysis for the west CBD is suggested.

Liberty Street/Crayton Road

Liberty Street/Crayton Road is classified as a minor thoroughfare on the updated thoroughfare plan at the city's request. It moves traffic from local streets to major thoroughfares such as US 25A-Sweeten Creek Road and Swannanoa River Road. In addition it is the only direct southwest to north movement in the area.

Liberty Street/Crayton Road is presently experiencing heavy traffic volumes. Through traffic from the Tunnel Road area destined for the south on Sweeten Creek Road is diverted onto Liberty Street/Crayton Road. This is changing the function of the road.

The City of Asheville now wishes to close Liberty Street/Crayton Road due to community pressures. This will force additional vehicles through the Historic Biltmore Village intersections (US 25/US 25A and All Souls Crescent/US 25) which is already experiencing operational problems. Widening is not possible at these intersections because of the historic nature of the area.

The construction of the new interchange at I-40 and US 25A (I-100) will reduce significantly the traffic on Liberty Street/Crayton Road. The through traffic would divert back to the new interchange. Liberty Street/Crayton Road will provide for low to medium traffic volumes alleviating conflicts with the interchange; and provides for a critical move as stated above.

Louisiana Avenue

Louisiana Avenue experiences residential and industrial traffic. Design year 2020 traffic is near the practical capacity in some areas. Transportation Improvement Program project #U-619 addresses these concerns by recommending widening to 4 lanes.

Upgrades

There are several minor thoroughfares which only need to be upgraded to achieve adequate design standards. In some instances this may be widening the facility a few feet or putting in turn lanes at key intersections or an intersection redesign. These facilities are Avery Creek Road, Bradley Branch Road, Clayton Road, Deaverview Road, Fairview Road, Fanning Bridge Road, Hazel Mill Road, Jenkins Valley Road, Monte Vista Road, Mount Carmel Road, Old Haywood Road, and Overlook Road.

TIP Projects

Two minor thoroughfares which will be brought to design standards with the Transportation Improvement Program (TIP) are Elk Mountain Road (U-401), Louisiana Avenue (U-619). These improvements will take these facilities to the design year 2020.

No Improvements

There were a lot of minor thoroughfares which did not need improvements at the time of this study. These thoroughfares are adequate to serve the present and future traffic demands. See Appendix A Street Inventory for these facilities.

Major Investment Study

The Major Investment Study (MIS) process was created to implement the Intermodal Surface Transportation Efficiency Act of 1991's call for a more integrated planning and project development process. MIS is aimed to improve transportation planning through collaborative decision-making, multimodal information analysis, and public involvement.

Major Investment Studies will be conducted on "High-type highway or transit improvement of substantial cost that is expected to have a significant effect on capacity, traffic, level of service or mode share at the transportation corridor or sub-scale area." The Future I-26 project (I-2513) falls in this category.

The Phase I Environmental Analysis Approach: Alternatives Analysis for the Asheville Urban Area Corridor Preservation Pilot Project incorporated this improved process. There were about five main alternatives studied for this corridor. Modes of transportation considered in the model analysis were highway, transit, walking, vanpooling, and carpooling.

Alternative modes of transportation are considered in all aspects of planning not only in the traffic model analysis. Alternative modes of transportation are evaluated again on the project planning level. Cost estimates were also obtained for the alternatives for cost comparison.

There was collaboration with the Asheville Metropolitan Organization, North Carolina Department of Transportation Division of Highways, Federal Highway Administration, Environmental Resource Agencies, Asheville Transit, and public citizens committees on the update of the Asheville Urban Area Transportation plan.

4. MODEL DEVELOPMENT

The travel forecast model is based on several major parameters. The parameters are the primary input for modeling how much travel there will be in future years and what routes and modes of transportation will be utilized. The projection of the socioeconomic data essentially determines where the needs are located. Included in this chapter is a description of the planning area and the existing and future land use projections. The following are described in detail: the trends and assumptions; the traffic analysis zones; the roads included in the computer network; the socioeconomic data collection method for the base year 1989; the projection of this data to years 2000, 2010, and 2020; and the projection of transit and carpooling use.

Trends and Assumptions

The assumptions upon which the traffic model has been developed are based on the continuation of present trends. The assumptions affect both the patterns and the volume of travel. The trends describe the present characteristics of travel and are based on objective, factual information. The assumptions represent the best conjecture of national and local experts as to expected trends during the next thirty years. The major trends and assumptions affecting Asheville are described in this section. The source for much of the information presented here was found in "Commuting in America, A National Report on Commuting Patterns and Trends" 1987, which was prepared by Alan E. Pisarski for the Eno Foundation for Transportation, Inc. Westport, CT.

Although much consideration has gone into the development of the assumptions, over time the actual trends may vary. To account for variance in the assumptions, the traffic model is continuously monitored and updated every five to seven years. In this way, the traffic model adjusts and accounts for changes in the assumptions upon which it is based.

Population growth is not a direct correlation to traffic growth. The three main contributions to the increase in traffic growth is the increase in number of workers, the increase in the number of jobs which have located in the suburban areas, and the increase in the use of private vehicles as a means of travel to work. The increase in the number of workers has been influenced by an increase in the number of available jobs, the Baby Boom entering the job force, and the increase of women in the workforce. The increase in the number of jobs available in suburban areas has been in response to the growing number of suburban residences and land availability. The increase of private vehicles as a means of travel to work has largely been influenced by an increase in auto ownership.

The Asheville Urban Area is affected to varying degrees by national trends. Included in the traffic model are the following assumptions:

1. A major trend which has shaped and is expected to continue to shape traffic growth in the Asheville area, is the increasing number of vehicles in proportion to population. This

growth indicates a continued increase in the availability and use of automobiles. The curve is expected to increase at a slower slope, but continue the upwards trend. This is similar to national and state trends. In Buncombe County, the number of registered vehicles per person grew from 0.28 in 1950 to 0.86 in 1990. By year 2020, 0.95 vehicles per person is projected.

2. A second assumption, which relates to the previous assumption, is that mode split will remain fairly constant. That is, as transit, walking, and bicycling increase the expected increase in auto usage will outweigh the other increases. This is substantiated in the Pisarski report referenced earlier in this section. In fact, the Pisarski report found that during the past decades transit and walking have decreased - not only as a modal split percentage but also in number.

   This is consistent with the ridership in Asheville which since 1987 has decreased from 1,048,691 to 862,144 in 1991. The transit projections in the Asheville Urban area are more optimistic and indicate growth of 1% per year. These future projections reflect the current desires of the local government.

3. Another major assumption is that the land use will occur as projected by the local area. This includes continuance of relatively low densities as well as the pinpointing of areas where development has been projected to occur.

4. The ratio of the number of employees to the population (E:P) is expected to increase slightly in the coming years because of employment recruitment by the local government. The 1989 E:P is 0.52 and the year 2020 E:P is projected to be 0.59. An increase in this ratio is expected to result in greater traffic volumes (i.e. more employees going to and from work).

5. Another assumption is that fuel will remain available at a cost adjusted for inflation. Increasing prices and decreasing fuel availability in the early 70's and again in the early 80's markedly reduced travel. However, when fuel once again became readily available, travel quickly increased up to the place it would have been if an energy crisis had not occurred.

6. The trend towards smaller family size and increasing numbers of women in the work force also contribute to an increase in the number of trips. Smaller family size results in more trips per household because there are less combined trips to work, shopping, etc. More women in the work force results in more work trips as well as other trips such as day care.

7. Finally, it is conjectured that the habits of society, that is, the number of trips for work and shopping will continue to increase in the coming years. Also, the proportion of disposable family income is projected to remain constant. This assumes that telecommuting and shopping by television will not occur in appreciable amounts. The trend in past years has actually been a decrease in work at home mainly due to a decrease in family farms.

Planning Area

The planning area for the Asheville urban area includes Asheville, Biltmore Forest, Black Mountain, Fletcher (in Henderson County), Montreat, Weaverville, Woodfin, and much of Buncombe County. Due to significant growth, the planning area is much larger than the 1975 planning area. Figure 4 illustrates the planning area boundary, external stations, and traffic analysis zones.

Based on population densities, the Census Bureau determined that although Black Mountain-Montreat and Weaverville are a considerable distance from Asheville, they are still a part of the urbanized area. As such, they were required by Federal law to be included in the thoroughfare plan update. However, because of their distance from Asheville and because they operate somewhat independently of Asheville, separate transportation plans were conducted for both Black Mountain- Montreat and Weaverville. Also because of the distance from Asheville and the noncontiguous shape of the planning area, it was concluded that the traffic model, TRANPLAN, would not have accurately modeled Black Mountain-Montreat and Weaverville. The Black Mountain-Montreat and Weaverville studies were conducted in the spring of 1991. The Black Mountain-Montreat thoroughfare plan was adopted by the Towns on June 10, 1991 and May 9, 1991 and by the Board of Transportation on August 2, 1991. The Weaverville thoroughfare plan was adopted by the Town on February 17, 1992 and by the Board of Transportation on March 6, 1992. The reports for these studies were done separately and are available at the

Asheville Planning Department
Post Office Box 7148
Asheville, NC 28802.

Traffic Analysis Zones

The planning area consists of 353 zones and 35 external stations. An external station occurs at the intersection of the planning area boundary with a road in the network. They are referred to as zones 354 to 389. Also, zones 390 to 399 are "dummy zones" - empty zones to be used if it became necessary to alter existing zones in this study or during an update study. The socioeconomic data that was collected for each zone served as the basis for the traffic model. That is, based on the type of housing and employment in each zone, trips were generated onto the road network.

The zone boundaries for the 1989 are the same as those used in the previous thoroughfare plan. For the new expanded zones, the boundaries were based on the following standard criteria:

1. to group similar land uses
2. to follow census tract boundaries, where practical
3. to coincide with property lines

4. to construct zones of adequate size and shape permitting detailed traffic analysis
5. to establish zones that display relatively uniform trip- making characteristics
6. to consider the existing transportation network as an important element in zone location
7. to consider the boundaries of political or municipal jurisdictions
8. to consider the location of study screenlines

The external stations, cordon stations 354 to 389, are on the outside edge of the planning area boundary. Each road that goes through the boundary is represented by an external station.

Road Network

All the roads on the 1975 thoroughfare plan were included for study in the 1989 update. Many other roads were added due to the expanded study area and growth in the area. All freeways and major roads were included. Also, all the streets which collected traffic onto the major roads were also included and are shown as minor streets. Only some of the local collector streets were included in the model. Appendix A lists the street inventory for the thoroughfares. The street inventory consists of the existing number of lanes, width, speed limits, rights-of- way, traffic counts, and capacities. It also lists the recommended cross sections for each road in the future.

To input the network into TRANPLAN, the nodes were first digitized utilizing AutoCAD to create x and y coordinates. A node represents the point where two roads cross; where a significant curve in the road occurs; or where a zone centroid is located. A centroid is the presumed center of activity in a zone. The connections of nodes to other nodes are termed links. Link information such as speed and distance are also input. This information is input into TRANPLAN and from the nodes, links, and link characteristics, a network is built. The network can be viewed in HNIS on the terminal screen. The network is then checked for accuracy by running paths between nodes. The paths were run on the minimum time, therefore a check on the speed and distance was conducted. Input errors such as incorrect speed limits were corrected at this stage.

Screenlines

Screenlines are imaginary lines drawn across the planning area. They are used as the first step in calibrating the traffic model. Since traffic counts are taken at every road which crosses the screenline, typical locations for screenlines are rivers and railroad lines. By choosing rivers and railroad lines, the number of roads crossing the screenline is minimized. The sum of the traffic counts on a screenline is compared to the sum of the traffic which is synthesized by the model. It is desirable for these sums to be within five percent of each other before going to the next stage of calibration. For the first step, matching the individual counts along the screenline is not as important as matching the sums of the modeled and actual traffic counts.

Asheville has only two screenlines - one going north-south along the French Broad River and one going east-west along Southern Railroad and the Swannanoa River. The traffic model resulted in the French Broad River screenline being 2.8% over the sum of the traffic counts. The

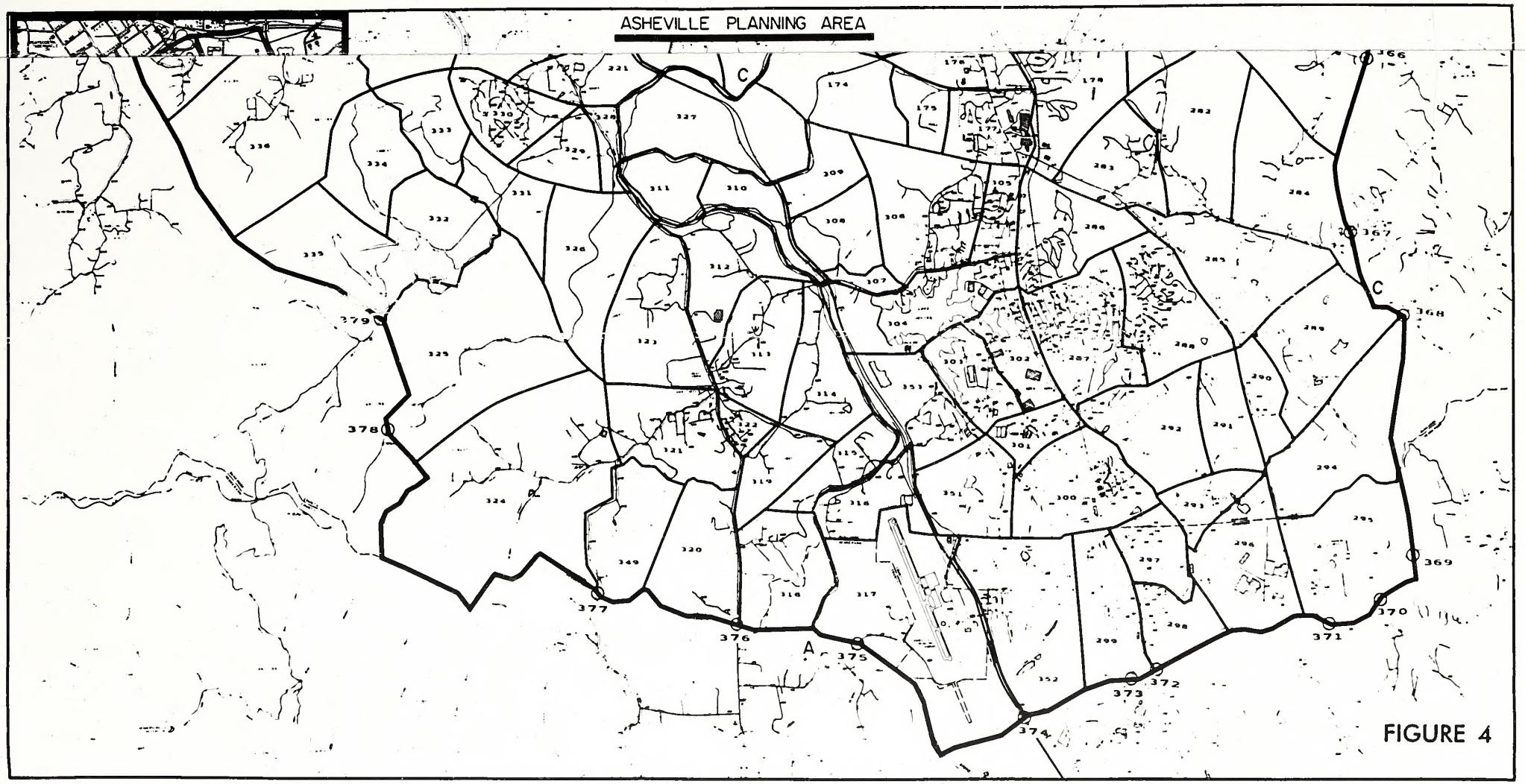
ASHEVILLE PLANNING AREA
C
A
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FIGURE 4

4. to construct zones of adequate size and shape permitting detailed traffic analysis
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6. to consider the existing transportation network as an important element in zone location
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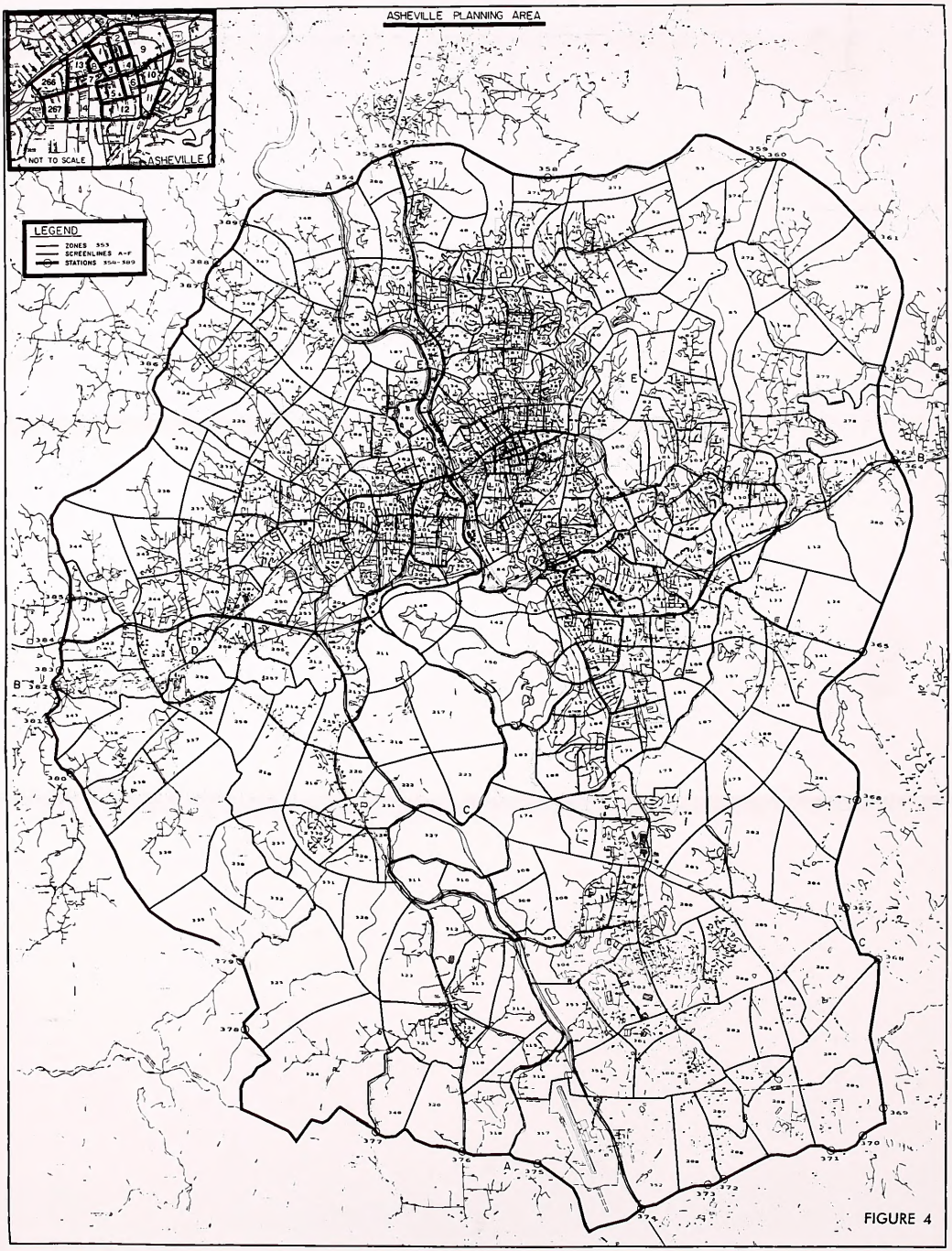
ASHEVILLE PLANNING AREA
LEGEND
ZONES 353
SCREENLINES A-F
STATIONS 354-389
NOT TO SCALE
ASHEVILLE

FIGURE 4

Swannanoa River screenline was 4.1% below the sum of the traffic counts. Figure 4 illustrates the screenlines.

Growth Factors

Existing and future land use are major inputs into the travel model. On behalf of the TCC and TAC, the Land-of-Sky Regional Council (LOSRC) estimated base year 1989 and future population; conducted surveys to determine base year 1989 housing and employment; and made projections as to future housing and employment.

The growth projections contained in the Asheville 2010 Plan provided a basis for land-use projections. Interviews were conducted with the Asheville Planning Department Staff, the Asheville Board of Realtors, Buncombe County Planning Department staff, a local developer, the TCC, and the TAC. These entities were considered to have a good idea of where housing and employment growth would occur.

The projections are described in detail in a report by LOSRC titled "Population, Dwelling Unit, Employment, Public Transportation, Carpooling, and Vanpooling - Estimates, Projections, and Assumptions". The results are summarized in the following sections.

Population

The type and quantity of land-use is a key factor when attempting to predict future traffic in an area. Estimates of population are the first step towards predicting future land use. Table 1 illustrates the base year 1989 and future year population projections.

Table 1 - Population and Socioeconomic Estimates

	Year		
	1989	2010	2020
Population	133,000	150,000	156,000
Dwelling Units	53,000	62,000	66,000
Employment	70,000	87,000	93,000
Employment:Population	0.52	0.58	0.59

Socioeconomic Data Collection

To begin the modeling process, up-to-date socioeconomic data was needed. The 1989 traffic counts were taken by NCDOT Traffic Survey Unit at different locations throughout the planning area. Housing and employment data was collected in the summer of 1989 by Land-of-Sky Regional Council. Each dwelling unit (i.e. single family house or apartment) was rated in a "windshield survey" as either excellent, above average, average, below average, or poor. The rating of the dwelling unit is a surrogate for income, and therefore an indication of the number of trips per day generated by the occupants. The data was collected by parcel and then compiled into zones.

Employment information was also collected by parcel and then compiled into zones. Each business was categorized as to its function and number of employees. Business functions were broken into five categories as follows:

Manufacturing
Wholesale Retail
Highway Retail
Office/Institutional
Services

Appendix B contains tables showing the number and type of dwelling units and employment in each zone. From these illustrations it is possible to pinpoint the areas of high density such as the Central Business District. Also, Table 1 shows the totals of the 1989 housing and employment in the Asheville planning area.

Socioeconomic Data Projection

The housing and employment data was then projected by zone to reflect the best available predictions of where and what type of growth will occur. Interviews were conducted with area planners, the Asheville Board of Realtors, the Chamber of Commerce, and area real estate agents to determine likely zones of high, low, or medium growth. By applying growth rates to each zone, the projected housing and employment by zone for the years 2010 and 2020 was determined.

Since the output of the model is directly based upon these inputs, the TCC and TAC were asked to approve the projections. After several months of refining the projections, the TCC and TAC approved the projections in June of 1992. This is contained in the report "Population, Dwelling Unit, Employment, Public Transportation, Carpooling, and Vanpooling - Estimates, Projections, and Assumptions" by LOSRC.

Appendix B contains tables showing the projected number and type of dwelling units and employment in each zone. Also, Table 1 shows the totals of the 2020 housing and employment projections in the Asheville planning area.

Walking, Carpooling, and Transit

Walking, carpooling, and transit are important modes of transportation available in Asheville in addition to vehicles. To evaluate their current and future impact on the transportation system, projections were determined by LOSRC. The input used in the model is summarized in this section. For a full description of the methods used to determine the carpooling and transit projections, refer to the report "Population, Dwelling Unit, Employment, Public Transportation, Carpooling, and Vanpooling - Estimates, Projections and Assumptions."

Walking

It was determined by LOSRC in concurrence with the TCC and TAC that the impacts of walking, both currently and in the future, were negligible in terms of the travel model. Although some walking trips take the place of car trips, there are not enough to cause any sizeable change in the travel model.

Carpooling

Carpooling is another mode of travel that was accounted for in the model. The average number of persons per vehicle is termed the vehicle occupancy rate (VOR). The VOR is developed annually by the Asheville Planning Department. Occupancy counts are taken at Patton Avenue, Merrimon Avenue, Tunnel Road, Biltmore Avenue, and McDowell Street. Since 1986 it has steadily been around 1.24 persons per vehicle. A slight increase of 0.01 per decade was projected during the planning period. This results in a VOR of 1.27 in year 2020. Table 2 illustrates the results of the VOR analysis.

Table 2 - Current and Projected Vehicle Occupancy Rates

Year	Vehicle Occupancy Rate
1990	1.24
2000	1.25
2010	1.26
2020	1.27

Source: Asheville Planning Department, Asheville Transit Authority and Land-of-Sky Regional Council, May 1992.

Transit

A sub-model of TRANPLAN was used to assess the impacts of transit on the road system. A propensity rating was selected by LOSRC for each zone. The rating signifies the likelihood of

transit use for each zone. For example, a zone with a high population density and high proportion of elderly persons would be more likely to utilize transit than a zone in a rural, farm area. The proportion of trips in the planning area expected to switch to transit in the future and the projected vehicle occupancy rate were also estimated. Finally, an optimistic projection was determined as a way to measure the impact if transit use is higher than expected.

The assumptions used by LOSRC when making the projections included the following:

1. The Asheville transit system will operate throughout the planning period.
2. A limited number of new routes will be added through year 2020.
3. Propensity ratings were based on the likelihood of person living within a zone to utilize public transit (i.e. not employment based trips)
4. Public transit trips were defined to include bus transit and elderly and handicapped transit trips.
5. Unless a major event such as new legislation mandating transit use or a dramatic increase in oil prices occurs, transit use in Asheville is expected to remain stable, with only a slight increase.

See Appendix B Table 3 for a summary of trips and Appendix C for a list of the transit propensities that were assigned to each zone.

5. DEFICIENCY ANALYSIS

This chapter presents an analysis of the ability of the existing road network to serve the area's travel desires both now and in the coming years. The essence of transportation planning is the ability to test and analyze different transportation configurations for efficiency in serving an area as it grows. Care and emphasis is placed, not only on detecting the major deficiencies, but on understanding their cause. Travel deficiencies may be localized; the result of inadequate pavement width; substandard highway design; inadequate intersection controls; an uncharacteristic peak travel demand; or some combination thereof. The underlying problem may be caused by a system deficiency such as a need for a bypass, loop facility, or additional radial service. The role of other modes of transportation to solve travel deficiencies is also considered.

Existing Road Network

Asheville is served by three Interstate routes, five US routes, and four NC routes. They are I-40, I-240, I-26, US 19, US 23, US 25, US 25 Alternate, US 70, US 74, NC 63, NC 81, NC 191, NC 280, and NC 694. The Blue Ridge Parkway, one of the Nation's most popular scenic highways, traverses the planning area. Major traffic carrying facilities are Patton Avenue, Haywood Road, I-40, I-26, I-240, US 19-23, Tunnel Road, Brevard Road (NC 191), Biltmore Avenue, Broadway Street, Merrimon Avenue, Hendersonville Road, Sweeten Creek Road, Riverside Drive, Lyman Street, Meadow Road, Charlotte Street, Swannanoa River Road, McDowell Street, Southside Avenue, Amboy Road, Kimberly Avenue, Leicester Highway, Airport Road, and Long Shoals Road.

The development of the road system is constrained by the mountainous topography and two major rivers in the area. The French Broad River runs north and south and the Swannanoa River runs east and west. There are many discontinuous and relatively short streets, especially in the Central Business District (CBD). The only major street passing completely through the CBD in a north-south direction is Biltmore Avenue-Broadway Street. Interstate 240 provides a northern border to the CBD and serves both east-west crosstown traffic as well as east-west downtown traffic.

1989 Travel on the Existing Road Network

A good indication of the adequacy of the existing road network is a comparison of traffic volumes with the ability of the streets to move traffic. In an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, the width of pavement, and the traffic control devices utilized. Thus, the ability of a street to move traffic can be increased to some degree by restricting parking and turning movements; using proper sign and signal devices; and by the application of other traffic engineering techniques. Capacity is defined as the maximum number of vehicles which has a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given time period under prevailing

roadway and traffic conditions. Level of service is the term used in the 1994 Highway Capacity Manual to describe the relationship of traffic volumes to the capacity of the roadway. Six levels of service are used and these identify the conditions existing under various speed and volume conditions. Appendix E contains definitions, photographs, and a table describing level of service in more detail. The level of service usually suitable for urban design is level of service C and is defined as being in the zone of stable flow with most drivers restricted in their freedom to select their own speed, change lanes, or pass. A relatively satisfactory operating speed is attained at this level of service. However, a level of service D is tolerated on an existing facility before it is considered operating over "practical" capacity.

When streets are operating below level of service D, speeds are well below the speed limit and travel times are increased. In addition, manuervability is severely limited and a driver's frustration level is generally much higher. This leads to driver's taking more chances on, for example left turns, and the distance between vehicles is severely diminished. Both of these factors result in additional accidents.

Figure 5 shows the deficiencies in the existing road network. Figure 6 shows the existing and committed road network with the 1989 and 2020 ADTs. The most significant problem areas are:

1. Smokey Park Bridge/Patton Avenue Area

A major travel problem in the Asheville Urban Area is that the Smokey Park Bridge is reaching capacity. The traffic volume is expected to increase at approximately 1.9% per year from the 1989 volume of 78,000 to a projected volume of 139,000. From 1960 to 1990 the traffic grew at a rate of 3.8% per year. If growth had been projected to increase at the current rate, the 2020 projected growth would have been 240,000 vehicles per day. There are eight lanes of pavement on the bridge. The typical capacity for eight freeway lanes is approximately 92,900 vehicles per day at LOS D. The capacity for the Smokey Park Bridge is at a LOS E because of the intense merging and weaving of traffic. The problem on the Smokey Park Bridge points to a larger issue with the Asheville Urban Area transportation system. Traffic from all over the area culminates on the bridge. It is not a localized capacity problem. There are several underlying reasons why the traffic ends up on the bridge. Namely, the major and minor street system designed to carry local traffic is not adequate to accommodate the travel demand. A large number of short, local trips utilize the freeway system. Thus, through and local travel are mixed onto the same freeways resulting in an over-capacity situation. The problem is especially intense on the Smokey Park Bridge where traffic from literally all over the urban area culminates on the bridge. The Asheville Urban Area road system has developed this way primarily due to the mountain topography as improvements to the street system result in impacts to environmentally sensitive areas and are financially costly.

2. Access to the CBD

Topographic constraints in the street system has led the CBD to develop with many discontinuous, short, and circuitous streets. Prior to the 1975 thoroughfare plan, the only north-south route through the downtown area was Biltmore Avenue and Broadway Street.

Since then, Southside Avenue has been completed which provides a north- south connection from Charlotte Street to McDowell Street.

The east-west crosstown system is primarily I-240. Thus, a significant portion of travel on the north part of I-240 is for very short trips which travel only one or two interchanges. This is an undesirable situation, since the primary purpose of a facility such as I-240 is for crosstown travel. In 1975, the Hilliard one-way pair was included in the thoroughfare plan as a means of providing a major east- west facility south of the central business area. Since that time, federal laws concerning historic properties have become more stringent and there are several potentially eligible projects in the alignment. Also, the city has built a public works building in the edge of the alignment. It would be difficult, but possibly feasible to overcome the obstacles in this alternative.

Both McDowell Street and Biltmore Avenue are projected to exceed practical capacity by the year 2020. To alleviate this situation, it may be possible to convert them into a one-way pair. Another travel deficiency in the area is the lack of direct connections from west Asheville to the CBD and the hospital area.

3. Biltmore Village Area

Biltmore Village is a relatively small area bounded by the Swannanoa River on the north and I-40 on the south. Biltmore Avenue serves as a major north-south facility between I-40 and areas south of I-40 to the hospitals and CBD. Biltmore Avenue also has the only public entrance and exit to the Biltmore Estate. On the east side of Biltmore Avenue lies the historic area which is a charming and active tourist shopping attraction. On the west side of Biltmore Avenue are two fast food restaurants and two gas stations. All of these factors contribute to the existing capacity of the road being severe in the Biltmore Village area. Sweeten Creek Road is also classified as severe near its intersection with Biltmore Avenue. All the traffic in the area traverses the congested intersection of Sweeten Creek Road (Lodge Avenue) and Biltmore Avenue.

4. Merrimon Avenue Area

Merrimon Avenue from I-240 to Beaverdam Road is currently classified as having heavy congestion. By the year 2020, as development continues to occur, Merrimon Avenue is expected to experience severe congestion. The area has a commercial strip of development close to the road. Older residential neighborhoods lie behind the commercial development. Spot widening at some intersections may be feasible to add turn lanes. Widening along the whole length of the road to add an additional lane is not feasible because of the many businesses and historic properties which are very close to the road. The possibility of reversible lanes is recommended to be studied later.

Currently, Charlotte Avenue, Kimberly Avenue, Broadway Street, and Weaver Boulevard all accommodate some diverted traffic from Merrimon Avenue. As congestion on the road

increases, especially during the peak hours of 7 to 9 am and 4 to 6 pm, traffic will continue to divert to these alternate routes. The combination of Broadway Street and Weaver Boulevard as a cut-through route will continue to increase in desirability as congestion on Merrimon Avenue increases. Elkwood Avenue and Lakeshore Drive will also experience the impacts of cut-through traffic diversions to avoid the congested section of Merrimon Avenue north of Beaver Lake.

5. **US 25 in Fletcher**

   The major travel difficulty in the Fletcher area is the over-capacity status of US 25. The problem has been addressed by the inclusion of projects R-2213 and R-2214 in the Transportation Improvement Program (TIP). These projects widen US 25 from 2 lanes to 5 lanes. The average daily traffic volume in 1992 varied from 10,700 to 15,600 vehicles per day. This is over the practical capacity of a two lane road, especially a two lane road such as US 25 with almost continuous driveways. The projected traffic on US 25 for the year 2020 varies between 24,000 and 32,000. The projected traffic reflects employment growth north of Fletcher into Asheville as well as moderate growth for the industrial area on the east side of Fletcher.

6. **Narrow, curvy two lane facilities**

   There are numerous narrow, curvy two lane facilities which serve as major thoroughfares in the outlying portions of the study area. A few of these roads are Riceville Road, Old Leicester Highway, and Town Mountain Road.

Traffic growth in the planning area has led to several areas of capacity deficiencies on the major street system. The highest levels of congestion occur on sections of NC 63, US 74, Sweeten Creek Road, Crayton Road, Hendersonville Road, Long Shoals Road and Airport Road. These areas are outlined in red in figures 5 and 6.

FIGURE 5

EXISTING ROAD CAPACITY DEFICIENCIES

(Based on 1989 Traffic Counts)

ASHEVILLE
PLANNING AREA

CONGESTION LEVEL	TRAFFIC VOLUME TO CAPACITY RATIO
Severe	> 1.25
Heavy	1.00-1.24
Moderate	0.85-0.99
No Count Available	

00,000 – 1989 TRAFFIC COUNTS (24 HOUR)

{00,000} – ROAD CAPACITY (INCLUDES TIP PROJECTS)

increases, especially during the peak hours of 7 to 9 am and 4 to 6 pm, traffic will continue to divert to these alternate routes. The combination of Broadway Street and Weaver Boulevard as a cut-through route will continue to increase in desirability as congestion on Merrimon Avenue increases. Elkwood Avenue and Lakeshore Drive will also experience the impacts of cut-through traffic diversions to avoid the congested section of Merrimon Avenue north of Beaver Lake.

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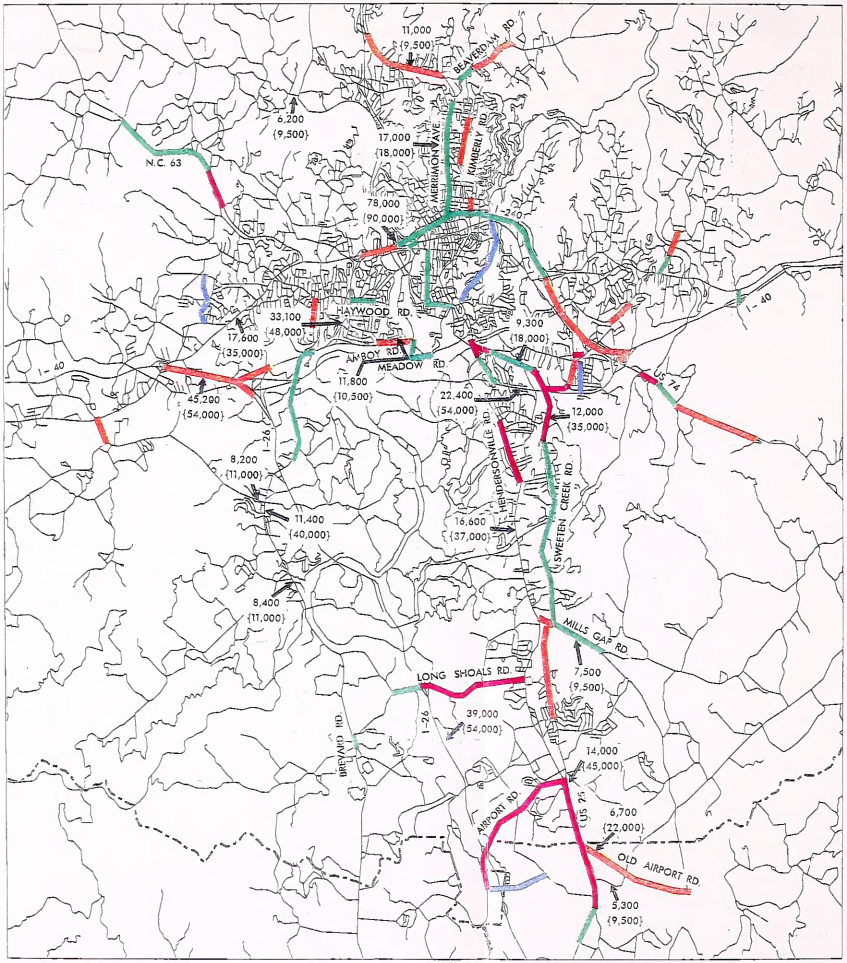
FIGURE 5

EXISTING ROAD CAPACITY DEFICIENCIES

(Based on 1989 Traffic Counts)

ASHEVILLE
PLANNING AREA



CONGESTION LEVEL		TRAFFIC VOLUME TO CAPACITY RATIO
	Severe	> 1.25
	Heavy	1.00-1.24
	Moderate	0.85-0.99
	No Count Available	

00,000	–	1989 TRAFFIC COUNTS (24 HOUR)
{00,000}	–	ROAD CAPACITY (INCLUDES TIP PROJECTS)

FIGURE 6

PACITY DEFICIENCIES
YEAR 2020
sting and committed street system)

ASHEVILLE
PLANNING AREA

NGESTION LEVEL	TRAFFIC VOLUME TO CAPACITY RATIO
Severe	> 1.25
Heavy	1.00-1.24
Moderate	0.85-0.99

00,000	–	1989 TRAFFIC COUNTS (24 HOUR)
{00,000}	–	ROAD CAPACITY (INCLUDES TIP PROJECTS)
[00,000]	–	YEAR 2020 PROJECTED VOLUME

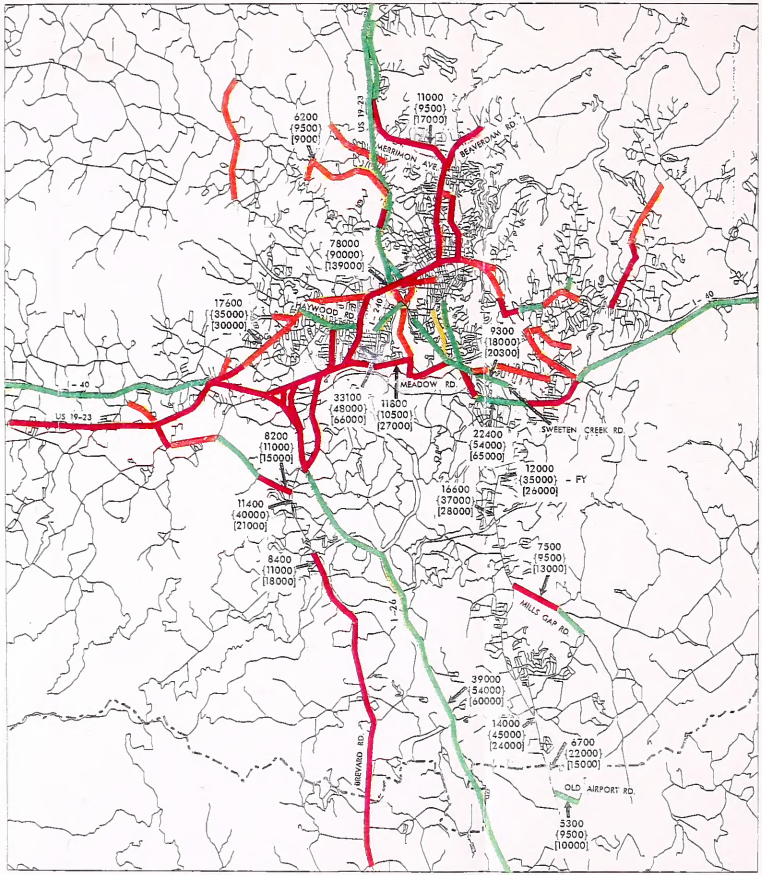
FIGURE 6

CAPACITY DEFICIENCIES YEAR 2020

(on existing and committed street system)

ASHEVILLE

PLANNING AREA



CONGESTION LEVEL	TRAFFIC VOLUME TO CAPACITY RATIO
Severe	> 1.25
Heavy	1.00-1.24
Moderate	0.85-0.99

00,000	–	1989 TRAFFIC COUNTS (24 HOUR)
{00,000}	–	ROAD CAPACITY (INCLUDES TIP PROJECTS)
[00,000]	–	YEAR 2020 PROJECTED VOLUME

Table 3 - Existing Capacity Deficiency - SEVERE

Facility	TIP project
NC 63 - Leicester Hwy	
(SR 1318 to SR 1369)	U-2000
US 74 - Charlotte Hwy	
(Blue Rdge Pkwy to SR 2835)	R-2306
Brook St - US 25A	
(US 25 to Fairview Rd)	none
Sweeten Creek Road - US 25A	
(SR 3230 to W Chapel Rd)	U-2801
Crayton Road- Liberty Rd	none
(Sweeten Crk Rd to Merchant St)	
Hendersonville Road - US 25	
(W Chapel to Rock Hill)	U-90
(US 25A to Henderson Co. Line)	R-2213
(Henderson Co. Line to SR 1006)	R-2214
(Swannanoa Rd to Crescent Ave)	none
Long Shoals Road - NC146	
(I-26 to US 25)	R-2813
Airport Road - NC 280	
(US 25 to Henderson Co. Line)	U-2402
(Henderson Co. Line to SR 3539)	R-401
Fairview Avenue	
(Cedar St to Stevens St)	none
Stevens Street	
(Fairview Ave to US 74)	none

Table 4 - Existing Capacity Deficiency - HEAVY

Facility	TIP project
SR 2838 (Black Mtn Hwy-US 70 to I-40)	none
Riceville Road (Black Mtn Hwy-US 70 to Bull Mtn Hwy)	none
US 74 (SR 2835 to Rose Hill Rd)	R-2306
I-240 (French River Rd to Tunnel Rd)	none
Merrimon Avenue (Elk Mtn Scenic Hwy to I 240)	none
Elk Mountain Scenic Highway (Dover St to Beaverdam Rd)	none
Haywood Road (I-240 to Beverly Rd)	none
South French Broad Avenue (Hilliard Rd to Livingston Rd)	none
Livingston Street (S French Broad Ave to Victoria Rd)	none
Lyman Meadow Road (Amboy Rd to Victoria Rd)	none
Wall Street (I-240 to Haywood St)	none
NC 63 - Leicester Hwy (Georgetown Rd-SR 1375 to SR 1369)	U-2000
NC 191 - Brevard Road (I-240 to Pine Ln)	U-2902
Long Shoals Rd -NC 146 (Clayton Rd to I-26)	R-2813
US 25 (SR 1006 to South 1 mile)	none
US 25A -Sweeten Creek Road (W Chapel Rd to Mills Gap Rd)	U-2801

Table 5 - Existing Capacity Deficiency - MODERATE

Facility	TIP Project
Beaverdam Road	
(Elk Mtn Scenic Hwy to Carter Cove)	none
US 25 (US 19/23/70 Exit to Wembley Rd)	none
Kimberly Road (Warwick Place to Evelyn Place)	none
Charlotte Street (I-240 to Baird St)	none
Riverside Drive	
(Pearson Bridge Rd to Broadway-NC251)	none
I- 240	
(Tunnel Rd to eastern I-40 Int)	none
(BYP US19/23 to French Broad Riv Brdg)	none
Swannanoa River Road	
(US 74 to Clubhouse Rd)	none
US 74	
(Rose Hill Rd to Cedar Mountain Rd)	R-2306
NC 191 (Haywood Rd to Morris St)	none
Amboy Road (State St to Lyman Ave-Meadow Rd)	none
I-40 (US19/23 to western I-240 & I-26 Int)	none
NC 112 (US 19/23 to SR 3437)	none
Mills Gap Road	
North (US 25 to US 25A)	none
South (US 25 to east 2 miles)	none
US 25A	
(Mills Gap Rd-N. to Royal Pines Dr)	U-2801
Liberty Street - Cedar Street	
(Merchant St to Fairview Rd)	none

2020 travel on the 1989 +
Committed Roadway System

Asheville's existing transportation system already has several deficient areas as indicated by the effects of 1991 travel on the existing road network (illustrated in figure 5). Several of those deficiencies will be alleviated by projects already in the Transportaion Improvement Program (TIP). They are Sweeten Creek Road, Leicester Highway (NC 63), US 25 in Fletcher, Long Shoals Road, US 74, Airport Road, and Brevard Road (NC 191).

Other existing deficiencies have not yet been planned for and will increase in severity as year 2020 approaches. These are Amboy Road, Beaverdam Road, Fairview Road, I-240, Meadow Road, Merrimon Avenue, Mills Gap Road, Kimberly Avenue, and Old Airport Road.

Still other deficiencies, not yet occurring, will begin to occur over the next thirty years. They are Biltmore Avenue, the southern part of Brevard Road, Charlotte Street, Enka Lake Road (NC 112), I-26, I-40, McDowell Street, Mills Gap Road, Riceville Road, Riverside Drive, and Swannanoa River Road.

6. IMPLEMENTATION

The North Carolina legislature enacted a highway bill which will provide $9.2 billion dollars over a 13.5 year period for highway construction and improvements. Revised revenue projections based on the first year's actual revenue collections, however, show that time period to be optimistic. It now appears that a period nearing 17 years in length will be needed to fund the entire program. Highway Trust Fund projects included in the Asheville Planning Area are: 1) I-40 widening, 2) US 23 complete 4-laning and upgrading, and 3) the Asheville Connector with improvements to existing corridors from I-26 to US 19/23 in north Asheville.

All the municipalities involved in the planning area and the North Carolina Department of Transportation have responsibility for implementation of the thoroughfare plan. North Carolina General Statutes 136-66.1 specify which elements of a plan are a State responsibility, and which are a municipal responsibility. In general, the state is responsible for those facilities which will be serving major volumes of through traffic and traffic from outside to major commercial, industrial, and institutional areas inside a municipality. Facilities which will serve principally internal travel are to be the responsibility of the municipality. A municipality may share in a portion of the right-of-way cost on projects constructed by the State depending upon the participation as determined by House Bill 1211.

This report will not deal with implementation strategies except to briefly describe all the tools currently available for implementation. Initiative for plan implementation will rest largely with the MPO and the local policy boards involved in the plan's development. Implementation of the plan will not be an easy task. However, there are a number of procedures, resources, and tools available to the area which can aid in plan implementation. These include local funding, Federal revenue sharing or block grants, urban bonds, redevelopment, municipal service district, zoning ordinance, subdivision ordinance, official maps, future street line ordinances, impact fee assessment, advance purchase of rights-of-way, and continued lobbying for State construction of needed facilities which are a State responsibility.

Effective and continuing use of available resources, tools, and programs over an extended period of time can result recommended projects being fully developed. A number of the administrative tools, ordinances, and procedures mentioned above may be new or not currently in use by all jurisdictions involved in the planning area. Also, many of these can be used effectively to make improvements to other elements of the thoroughfare system which would be desirable but were not identified as specific needs. A more detailed discussion of these tools, ordinances, and procedures follow:

Subdivision Control

A subdivision ordinance requires every subdivider to submit a plot of his proposed subdivision to the Planning Board in authority for review and approval. Certain standards must

be met by the developer before he can be issued a building permit to construct his development. Through this process, it is possible to obtain, or protect from development the necessary right-of-way for streets which are a part of the thoroughfare plan. Street construction in accordance with the plan can be required.

Appendix E gives recommended definitions and design standards for subdivision ordinances. Extraterritorial subdivision controls are important, especially for municipalities bordered by Counties who do not have subdivision controls. A review of their present ordinance by all the local governments in the planning area to insure it is up-to-date and compatible with the thoroughfare plan is desirable.

Future Street Line Ordinance

This ordinance is a particular benefit where widening of a street will be necessary at some time in the future. A municipality with legislative approval may amend its charter to be empowered to adopt future street line ordinances. Through a metes and bound description of a streets future right-of-way requirements, the municipality may prohibit new construction or reconstruction of structures within the future right-of-way. This approach requires specific design of the facility and would usually require surveys and public hearings to allow affected property owners to know what to expect and make necessary adjustments without undue hardship. A specific ordinance can be enacted for selected streets.

Zoning

A zoning ordinance is beneficial to thoroughfare planning in that planned locations of various land uses and their densities can be realized. This provides a degree of stability on which to forecast travel and to plan the street system.

Other benefits include (1) the establishment of standards of development which will aid traffic operations on major thoroughfares; (2) the minimization of strip commercial development which creates traffic friction and increases the traffic accident potential; and (3) the requirement for provision of off-street parking by new development with the purpose of eventual prohibition of all curb parking on major thoroughfares.

Redevelopment

Redevelopment is the term used to describe efforts toward the removal or rehabilitation of undesirable development. It is one of the few tools available that can be used to correct basic mistakes in the street system such as (1) poor design, (2) poor layout, or, (3) too many streets.

Municipal Service Districts

Under Chapter 160A, Section 535-543 of the General Statutes, the legislative body of a municipality may create one or more municipal service districts in a downtown commercial area in

order to raise additional funds for physical improvements. One of the stipulated purposes of the district is to facilitate traffic flow and parking. The district may float a bond issue which would be paid off with revenues from any extra ad valorem tax on all property within the district's boundaries. Once the improvements have been completed and the bonds retired, the extra tax would cease and the district would dissolve.

Capital Improvements Program

One of the tools which makes it easy to build a planned thoroughfare system is a capital improvements program. This is a long range plan for the spending of money on street improvements, acquisition of rights-of-way, and other capital improvements within the bounds of projected revenues. Municipal revenues will need to be available for street construction that is a municipal responsibility, right-of-way cost sharing on projects that are a state responsibility, and advance purchase of right-of-way where such action is appropriate.

The estimated cost of projects or elements of projects identified as being needed within the design period for this thoroughfare plan are included in a financial constraint report. (As of the printing of this report an updated system's responsibility agreement which would identify which projects are State and local responsibility has not been completed.)

Development Reviews

Driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and the Traffic Engineering Branch of the Department of Transportation prior to access being allowed. Any development expected to generate large volumes of traffic (e.g. shopping centers, fast food restaurants, large industries, etc.) may be comprehensively studied by a review team or staff from Traffic Engineering, Planning and Environmental, and Roadway Design Branches of the Department. If this is done at an early stage, it is often possible to significantly improve the developments accessibility at minimal expense. Since the municipality is often the first point of contact for development interests, it is important that the municipality advises developers of this review requirement and cooperates in the review.

Roadway Corridor Official Map

The North Carolina Statutes 136-44.50 through 136-44.53 are collectively designated as the "Roadway Corridor Official Map Act". For the municipalities contemplating the adoption of a Road way Corridor Map, more commonly referred to as Official Map, there are several things to consider prior to implementation. First and foremost, it should be recognized that Official Map designation places severe but temporary restrictions on private property rights. These restrictions are in the form of a prohibition, for a period of up to three years, on the issuance of building permits or the approval of subdivisions on property lying within an Official Map alignment. This pushes local governmental powers to new limits. Consequently, this new authority should be used carefully and only in cases where less restrictive powers are found to be ineffective.

The Statute establishing the Official Map authority is fairly explicit in outlining the procedures to be followed and the types of projects to be considered of Official Map designation. As required by statute, a project being considered for an Official Map must be on the adopted street system plan.

The Program and Policy Branch of the Division of Highways is responsible for facilitating the adoption of Official Maps. Cities considering Official Map projects should contact this Branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Maps" at P.O. Box 25201, Raleigh, North Carolina 27611.

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
NEW LOCATIONS											
Asheville Connector	US 19/23 to I-240	0.80	—	—	55	59000	—	40000	A	230	I-2513
Northwest Connector	US 19/23 to NC 63	4.00	—	—	45	59000	—	25000	A	230	
Sweeten Creek Extension	US 25A to Swannanoa River Road	0.20	—	—	35	27000	—	12000	D	90	
Cane Creek Extension	Cane Creek to Old Howard Gap Road	0.50	—	—	45	27000	—	10000	D	90	PN # 23
FREEWAYS											
I-26	South Planning Boundary to Airport Road (SR 3539)	1.20	48	270	55	55,000	33,100	60,000	M	300	
	Airport Road (SR 3539) to NC 146	3.00	48	270	55	55,000	39,100	60,000	M	300	
	NC 146 to NC 191	4.60	48	270	55	55,000	36,000	69,000	M	300	
	NC 191 to I-40	1.60	48	240	55	55,000	48,000	94,000	M	300	
I-40	Western Planning Boundary to US 19/23	2.00	48	240	55	54,000	27,500	58,000	M	300	
	US 19/23 to I-26	1.50	48	240	55	54,000	45,700	79,000	M	300	
	I-26 to NC 191	0.60	48	240	55	54,000	18,700	30,400	M	300	For Cont.
	NC 191 to US 25	3.80	48	240	55	54,000	24,000	34,000	M	300	For Cont.
	US 25 to I-240	2.60	48	320	55	54,000	22,400	65,000	M	ADQ	
	I-240 to Eastern Planning Boundary	5.70	48	320	55	54,000	29,100	55,000	M	ADQ	
I-240	I-40 to US 19/23	2.80	48	170	55	64,000	40,000	67,000	E	ADQ	
	US 19/23 to Chunns Cove Road	2.20	58	260	55	64,000	40,400	72,000	E	ADQ	
	Chunns Cove Road to US 70	1.10	99	700	55	64,000	35,800	67,000	ADQ	ADQ	
	US 70 to I-40	2.10	48	500	55	54,000	27,400	33,000	ADQ	ADQ	
US 19/23/70	I-240 to Broadway Ave (SR 1781)	1.80	48	260	55	48,000	30,300	55,000	M	300	
	Broadway Avenue (SR 1781) to Lakeshore Drive	1.20	48	260	55	48,000	31,500	55,000	M	300	
	Lakeshore Drive to Northern Planning Boundary	4.20	48	260	55	54,000	27,700	56,000	M	300	
MAJOR THOROUGHFARES											
Airport Road (NC 280)	NC 191 to I-26	1.60	64	100	55	43000	—	26000	ADQ	ADQ	
	I-26 to US 25	1.90	24	60-100	45	7,500	13,300	36,000	O or F	ADQ	TIP U-2402
Amboy Road (SR 3557)	I-240 to Lyman Road	1.60	21-26	---	35	16,500	11,000	27,000	O or F	90	
Asheland Avenue	McDowell Street (US 25) to Patton Avenue	0.70	50	~60	35	18,000	10,000	15,500	ADQ	ADQ	

APPENDIX A – ASHEVILLE URBAN AREA STREET INVENTORY

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
Beaverdam Road (SR 2053)	Merrimon Avenue (US 25) to Elk Mtn. Scenic Hwy. (SR 2230)	0.40	18	60	35	6,000	6,700	11,500	P	70-100	PN # 10
	Elk Mtn. Scenic Hwy. (SR 2230) to Webb Cove Road (SR 2053)	1.80	18	60	35	6,000	6,400	12,000	P	70-100	PN # 10
Biltmore Avenue (SR 3214)	Meadow Road (NC 81) to Southside Avenue	1.40	40-52	60	35	25,000	19,500	30,000	Upgrade	ADQ	U-3404, Mod. 1-way
	Southside Avenue to Pack Square	1.00	20	40-50	35	20,000	11,500	17,000	Under	Study	
Blue Ridge Parkway	Chestnut Overlook to Brevard Road (NC 191)	4.70	21-24	—	35	9,500	970	1,200	ADQ	60	
	Brevard Road (NC 191) to Webb Cove Road (Sr 2053)	16.10	21-24	—	35	9,500	2,800	6,000	ADQ	60	
	Webb Cove Road (SR 2053) to Northern Planning Boundary										
Brevard Road (NC 191)	NC 280 to NC 146	3.40	20	60	55	9,500	7,400	18,000	O	90	U-3403
(see also Minor Thoroughfares)	NC 146 to Clayton Road	1.40	20	60	55	9,500	6,200	14,000	O	90	U-3403
	Clayton Road to Wesley Bridge Road (SR 3484)	1.50	20	60	55	11,000	10,600	18,000	O	90	U-3403
	Wesley Bridge Road (SR 3484) to Sardis Road (NC 112)	1.40	20	60	55	11,000	8,400	18,000	O	90	U-3403
	Sardis Road (NC 112) to I-26	0.57	24	90	55	40,000	12,100	21,000	ADQ	ADQ	U-3403
	I-26 to I-240	1.90	24	130	55	7,500	10,600	16,000	O	ADQ	U-3403
Broadway Avenue (SR 1781)	Pack Square to I-240	0.34	24	50-90	35	18,000	11,000	17,000	ADQ	ADQ	
	I-240 to Woodrow Avenue	0.60	20-24	50-90	35	9,500	6,000	17,000	H	ADQ	TIP U-1001
	Woodrow Avenue to Catawba Street	0.40	20	90	35	9,500	5,000	16,000	G	ADQ	TIP U-1001
	Catawba Street to Riverside Drive	0.80	20	90	35	21,000	7,500	18,000	ADQ	ADQ	
South Charlotte Street	Biltmore Avenue to College Street	0.70	64	90	35	26,000	12,000	16,300	ADQ	ADQ	Turn Lanes
(see also Minor Thoroughfares)	College Street to Woodfin Place	0.10	40	90	35	22,000	19,000	30,000	Under	Study	Turn Lanes
	Woodfin Place to Orchard Street (I-240 Bridge)	0.10	40	90	35	22,000	19,000	30,000	Under	Study	Turn Lanes
Clingman Avenue (SR 3548)	Depot Street to Patton Avenue	0.40	34	150	35	7,500-9,000	6,500	8,000	ADQ	ADQ	
College Street (SR 2501)	Patton Avenue to Broadway Avenue	0.40	33	56	35	7,500	—	5,000	ADQ	ADQ	
	Broadway Avenue to Market Street (SR 1781)	0.10	33	60	35	7,500	—	5,000	ADQ	ADQ	
	Market Street to Woodfin Street	0.20	76	100	35	26,000	—	8,000	ADQ	ADQ	
	Woodfin Street to Town Mtn. Road (NC 694)	0.20	50	80-100	45	20,000	—	~10,000	ADQ	ADQ	
Erwin Hills Road (SR 1367)	Lee Creek Road (SR 1368) to Old Leicester Hwy. (SR 1002)	0.90	20	—	55	9,500	1,900	4,400	ADQ	ADQ	
French Broad Avenue	Livingston Street to Haywood Street	0.70	20	50	35	9,500	—	7,300	ADQ	ADQ	
Haywood Road (SR 3552)	Patton Ave to Sulpher Springs	0.60	30	—	30	12,000	10,400	19,000	Under	Study	
	Sulpher Springs to Brevard Road	0.30	30	—	20	12,000	14,000	19,000	Under	Study	

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
	Brevard Road to Ridgelawn Road	1.10	30	—	20	12,000	13,500	24,000	Under	Study	
	Ridgelawn Road to Craven Street	0.70	30	50	35	12,000	6,500	11,000	Under	Study	
	Craven Street to Clingman Avenue	0.30	60	50	35	12,000	6,500	11,000	Under	Study	
Hendersonville Road (US 25)	SR 1361 to US 25A	3.40	24	60	45	12,000	16,600	32,000	O	90	TIP R-2213
	US 25A to Spring Side (SR 3506)	2.40	64	60-80	45	24,000	19,600	24,000	ADQ	ADQ	TIP R-2213
	Spring Side (SR 3506) to Rock Hill Road (Sr 3081)	3.10	64	80	35	29,000	16,600	28,000	ADQ	ADQ	
	Rock Hill Road to I-40	1.90	40-52	120	35	29,000	19,200	26,000	ADQ	ADQ	
	I-40 to Meadow Road /NC 81	0.50	52-64	~80	25	25,000	24,000	39,000	Under	Study	
Hilliard Street	Clingman Avenue to South French Broad Avenue	0.40	31	40	25	11,000	—	12,000	ADQ	ADQ	
	South French Broad Avenue to Biltmore Avenue	0.50	35	40	25	11,000	—	12,000	ADQ	ADQ	
Lee Creek Road	Mt. Carmel Road (SR 1369) to Erwin Hills Road (SR 1367)	0.40	20	60	35	7,000	—	2,900	ADQ	ADQ	
Leicester Hwy. (NC 63)	Patton Avenue to Northern Planning Boundary	3.10	64	100	45	37,000	18,800	29,000	ADQ	ADQ	TIP U-3301
Long Shoals Road/NC 280	NC 280/191 to US 25	3.50	22-24	60-100	35-45	7,500	5,600	9,600	O	ADQ	TIP R-2813
Lyman Avenue	Amboy Road to Riverside Drive	1.30	32	48	35	7,500	5,400	8,000	P	100	Upgrade
McDowell Street (US 25)	Hendersonville Road to Meadow Road (SR 3556)	0.50	52-64	80	25	20,000	14,600	28,000	O	90	Mod. 1-way
	Meadow Road (SR 3556) to Southside Avenue	1.60	40	60	35	20,000	16,100	28,000	O	90	PN # 18
Meadow Road (SR 3556)	Amboy Road to McDowell Street	1.30	20	30-50	35	11,000	15,400	35,000	O	90	
	McDowell Street to Biltmore Avenue	0.30	20-24	30-50	35	11,000	8,000	17,000	O	90	
Merrimon Avenue (US 25)	I-240 to W. T. Weaver Blvd.	1.10	38-42	60	35	18,000	17,000	28,000	Study	ADQ	PN #1 Turn Lanes
or Weaverville Road	W. T. Weaver Blvd. to Edgewood Drive	0.40	38-42	60	35	18,000	16,500	22,000	Study	ADQ	PN #1 Turn Lanes
	Edgewood Drive to Lakeshore Drive	0.50	38-42	60	35	18,000	17,000	25,000	Study	ADQ	PN #1 Turn Lanes
	Lakeshore Drive to Beaverdam Road	0.20	38-42	60	35	18,000	18,900	30,000	Study	ADQ	PN #1 Turn Lanes
	Beaverdam Road to Wembley Avenue	0.30	38-42	60	35	18,000	10,400	19,000	Study	ADQ	PN #1 Turn Lanes
	Wembley Avenue to Elkwood Avenue	1.00	38-42	60	35	9,500	11,000	17,000	Study	ADQ	PN #1 Turn Lanes
Mills Gap Road (SR 1551/SR 3116)	US 25 to Concord Road (SR 3151)	1.40	20	—	35	9,500	7,500	13,000	Upgrade	100	PN # 14
(Henderson/Buncombe)	Concord Road (SR 3151) to Cane Creek Road (SR 3136)	3.20	20	—	55	9,500	5,800	10,000	Upgrade	100	PN # 14
	Cane Creek Road (SR 3136) to Cane Creek Road (SR 3136)	2.80	20	—	55	22,000	7,100	14,300	Upgrade	100	PN # 14
NC 151	US 19/23 to South Planning Boundary	0.80	18-38	6--150	55	7,500	—	1,300	ADQ	ADQ	TIP R-2116

APPENDIX A – ASHEVILLE URBAN AREA STREET INVENTORY

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
Old Airport Road (SR 1547)	US 25 to Cane Creek Road	0.90	34	~80	35	7,500	6,900	15,600	H	70	PN # 12
Old Leicester Highway (SR 1002)	Mt. Carmel Road to Erwin Hills Road	1.40	18-20	—	55	9,500	2,100	3,600	P	ADQ	
	Erwin Hills Road to Gorman Bridge Road	0.50	18-20	—	55	9,500	4,400	6,600	P	ADQ	
	Gorman Bridge Road to Riverside Drive	0.60	18-20	—	55	9,500	6,200	4,000	P	ADQ	
Patton Avenue (SR 2115)	US 19/23/70 (east of French Broad River) to College Street	1.00	65-75	150	45	17,500	—	24,300	Under	Study	
	I-240 to Haywood Road	0.80	40-46	150	45	17,500	6,300	26,600	Under	Study	
Patton Avenue - One Way Eastbound	West College Street to Spruce Street	0.10	33	—	35	7,500	—	5,300	Under	Study	
Porter Cove Road (SR 2838)	US 70 to I-40	0.20	—	160	45	35,000	9,000	19,000	ADQ	ADQ	
Ralph Street	Bartlett Street to South French Broad Avenue	0.30	36	50	35	18,000	—	12,000	ADQ	ADQ	
Riverside Drive/NC 251	Lyman Avenue to Broadway	2.50	20	—	35	7,500	6,700	9,700	P	100	Turn Lanes
	Broadway Street to Walnut Lane	0.70	20-22	60	55	9,500	5,600	8,500	P	100	PN # 4
	Walnut Lane to Northern Planning Boundary	2.40	20	60	55	9,500	1,800	2,600	P	100	PN # 4
Sardis Road/NC 112	US 19/23 to Case Cove Road (SR 3437)	0.50	24-64	100	45	11,000	9,700	18,000	O	90	
	Case Cove Road (SR 3437) to Sandhill Road (SR 3412)	1.10	24	60	45	11,000	6,000	10,000	O	90	
	Sandhills Road (SR 3412) to Brevard Road (NC 191)	2.10	24	100	45	11,000	8,200	15,000	O	90	
Southside Avenue	McDowell Street (US 25) to Biltmore Avenue	0.50	40	—	35	20,000	6,700	10,400	ADQ	ADQ	
Swannanoa River Road	Biltmore Avenue to I- 240	1.70	24	60	45	10,000	8,500	12,000	P	100	
	I - 240 to US 74	1.20	20	60	45	16,000	8,500	14,000	P	100	
	US 74 to US 70	1.20	26	60	45	30,000	10,300	15,000	P	100	
Sweeten Creek Road US 25A	US 25 (at Airport Road) to I-40	6.90	22-30	60	45	10,000	12,000	26,000	O	90	TIP U-2801
	I-40 to US 25 in Biltmore Village	1.70	40-50	60	25-45	18,000	9,300	20,300	O	90	TIP U-2801
Town Mountain Road (NC 694)	College Street to I-240	0.20	20	60	55	7,500	2,200	4,500	ADQ	ADQ	
	I-240 to Webb Cove Road (SR 2053)	6.10	36	100	35	7,000	500	1,800	ADQ	ADQ	
Tunnel Road (US 70)	College Street to Kenilworth Drive	1.00	32-64	100	35	25,000	13,400	22,000	ADQ	ADQ	
	Kenilworth Drive to NC 81	1.00	45	100	35	22,000	20,800	36,000	Under	Study	
	NC 81 to US 70	0.70	60	60-100	45	25,000	9,000	13,000	ADQ	ADQ	

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
US 19/23	Western Planning Boundary to I-40	2.50	64	150	45	30,000	26,200	54,000	E	110	
	I-40 to Haywood Road	0.60	44-52	150	35	35,000	24,100	44,000	E	110	
US 70	US 74 to Governors View	1.70	~58	~100	45	40,000	26,000	41,000	ADQ	ADQ	
	Governors View to Grassy Branch Road (SR 2403)	1.40	~58	~100	45	37,000	17,500	31,000	ADQ	ADQ	
	Grassy Branch Road (2403) to East Planning Boundary	3.20	~58	~100	45	36,000	16,100	36,000	ADQ	ADQ	
US 74 (Charlotte Highway)	US 70 to NC 81 West	0.63	52	60-100	25-45	25,000	9,000	13,000	ADQ	ADQ	
	NC 81 West to NC 81 East	1.20	20	60	45	16,000	8,500	14,000	ADQ	ADQ	
	NC 81 East to I-240 at River Ridge	0.58	~22	200	45	33,500	13,500	21,000	N	90	
	I-240 to southeast planning boundary	5.80	48	~60	55	9,000	11,000	19,000	ADQ	ADQ	TIP R-2306
W. T. Weaver Blvd. (SR 1730)	Broadway Avenue (SR 1781) to Merrimon Avenue (US 25)	0.80	48	60	35	33,500	6,000	12,000	ADQ	ADQ	
Weaverville Hwy. (US 25)	Elkwood Avenue (SR 1674) to Northern Planning Boundary	0.60	24	60	45	12,000	8,400	13,000	H	60	PN # 5 & # 20
MINOR THOROUGHFARES											
Acton Circle (SR 1245)	US 19/23 to US 19/23	0.42	18	---	55	7,500	100	---	ADQ	ADQ	
Asbury Road (SR 1234)	Monte Vista Road(SR 1224) to US 19/23	1.80	18	---	35	7,500	3,100	3,700	ADQ	ADQ	Parking
Avery Creek Road (SR 3486)	Dead End to Brevard Road (NC 191)	2.40	18	---	55	6,000	1,800	3,500	ADQ	ADQ	
	Brevard Road (NC 191/280) to Glen Bridge Road (SR 3495)	1.80	16-18	---	55	7,000	1,300	3,500	ADQ	ADQ	
Azalea Road (SR2754)	Swannanoa River Road to US 70	2.30	18	60	55	9,500	2,200	3,600	ADQ	ADQ	
Baldwin Road (SR 3189)	Christ School Road (SR 3188) to Lower Christ School Road	1.10	18	60	55	7,500	1,000	3,600	ADQ	ADQ	
Bartlett Street	Depot Street to Ralph Street	0.10	33	40	35	11,000	---	10,000	ADQ	ADQ	
Bear Creek Road (SR 1630)	Haywood Road (US 19/23) to Old County Home Road (SR 1315)	1.30	19	30	55	7,500	3,000	4,700	ADQ	ADQ	
Bent Creek Road (SR 3480)	Pole Creasman Road (Sr 3476) to Wesley Bridge Road (SR 3484)	0.40	26	60	35	8,500	100	---	ADQ	ADQ	
Beverly Road	New Haw Creek Road to US 70	0.38	19	60	35	7,500	5,900	6,000	ADQ	ADQ	
Bingham Road (SR 1350)	Emma Road (SR 1338) to Pearson Bridge Road (SR 1348)	0.80	12	---	35	6,500	2,300	3,000	ADQ	ADQ	

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
Bingham Heights Road (SR 1349)	Riverview Road (SR 1353) to Louisana Avenue (SR1332)	0.40	18	—	55	11,000	600	9,200	ADQ	ADQ	
Brevard Road (NC 191) (see also Major Thoroughfares)	I-240 to Haywood Road	3.00	20-24	60	20	7,500	7,200	11,000	Under	Study	
Browntown Road (SR 1297)	Stuyvesant Road to Hendersonville Road (US 25)	0.80	20	—	35	7,000	1,800	2,500	ADQ	ADQ	
Buff Creek Road (SR 2424)	Northern Planning Boundary to Shope Creek Road (SR 2426)		12	—	55	5,000	200	1,000	ADQ	ADQ	
Busbee Road	Vanderbilt Road to Hendersonville Road (US 25)	0.20	18	—	35	7,500	1,700	2,500	ADQ	ADQ	
Caledonia Road	Biltmore Avenue to Foresthill Drive	0.28	22	30	35	18,000	—	4,500	ADQ	ADQ	
Cane Creek Road (SR 1545)	US 25 to Henderson County Line	1.30	28	—	55	7,500	5,000	6,000	ADQ	ADQ	
Cane Creek Road (SR 3136)	Henderson County Line to Eastern Planning Boundary	2.90	20	—	35	9,500	5,300	9,500	ADQ	ADQ	
Caribou Road (SR 3223)	Hendersonville Road (US 25) to Sweeten Creek (US 25A)	2.10	15-22	—	30	7,000	—	1,500	ADQ	ADQ	
Cedar Hill Road (SR 1263)	Johnston School Road (SR 1319) to Pisgah View Road (SR 1403)	0.40	16	—	25	7,500	—	2,500	ADQ	ADQ	
Charlotte Street	Orchard Street to Chestnut Street	0.10	41	50	35	22,000	—	26,000	Q	90	
(see also Major Thoroughfares)	Chestnut Street to Edwin Lane	0.47	41	50	35	22,000	—	26,000	Q	90	
Chestnut Street	Charlotte Street to Broadway Street	0.59	24	40	30	7,500	3,700	5,000	ADQ	ADQ	
	Broadway Street to Flint Street	0.16	30	40	30	7,500	3,700	5,000	ADQ	ADQ	
	Flint Street to Montford Avenue	0.20	26	40	30	7,500	3,700	5,000	ADQ	ADQ	
Choctaw Street	McDowell Street to South French Broad Avenue/	0.35	39	60	35	7,500	—	10,000	ADQ	ADQ	
Christ School Road (SR 3188)	Pensacola Avenue to Baldwin Road (SR 3189)	0.38	17	—	55	7,500	500	3,500	ADQ	ADQ	
	Baldwin Road (SR 3189) to Lower Christ School Road (SR 3197)	1.14	17	—	55	7,500	500	3,500	ADQ	ADQ	
Chunn's Cove Road (SR 2042)	Tunnel Road to Old Chunn's Cove Road	0.50	24-44	60	35	7,000	1,500	4,000	ADQ	ADQ	
	Old Chunn's Cove Road to SR 2208	1.20	16	60	35	7,000	1,500	2,000	ADQ	ADQ	
Clayton Road (SR 3501)	Brevard Road (NC 191) to Long Shoals Road (NC 146)	1.30	18	—	55	7,000	9,500	12,000	P	100	
Concord Road (SR 3150)	Mills Gap Road (SR 3116) to Emma's Grove Road (SR 3128)	2.56	16	—	55	6,500	—	5,000	ADQ	ADQ	

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
Beaverview Road (SR 1263)	Pisgah View Road (SR 1403) to Patton Avenue (US 19/23)	1.30	16	—	25	7,500	5,700	7,000	P	100	UPGRADE
Depot Street	Lyman Street to Livingston Street	0.45	40	—	35	75,000	—	12,000	ADQ	ADQ	
Dogwood Road (SR 1220)	I-40 to US 19/23	0.30	16	—	35	7,500	2,600	3,500	ADQ	ADQ	
Dryman Mtn. Road	Mt. Carmel Road to Urban Boundary	0.50	18		45	7,500	3,200	3,500	ADQ	60	
or Emma Road (SR 1338)	Urban Boundary to Near Jamieson Street	1.50	18	30	35	7,500	3,200	4,000	ADQ	60	
	Jamieson Street to Smith Bridge	1.90	18		35	7,500	2,700	3,000	ADQ	60	
Edwin Place	Kimberly Avenue to Charlotte Street	0.40	32	80	25	11,000	—	18,000	Under	Study	
Elida Home Road (SR 1318)	Leicester Hwy. (NC 63) to North City Limits	0.70	16	60	35	7,000	1,200	4,000	ADQ	ADQ	
	North City Limits to Dryman Mtn. Road (SR 1338)	0.50	16	60	55	7,000	—	1,500	ADQ	ADQ	
Elk Mountain Road (SR 1684)	Lower Beaverdam Creek Road to Cottage Street	1.60	35	50	35	7,500	5,700	8,000	J	70	S/W, TIP U-401
	Cottage Street to US 19/23	0.70	33-38	50	35	7,500	5,700	8,000	J	70	S/W, TIP U-401
	US 19/23 to Lakeshore Drive	3.00	18-24	—	30	9,000	5,700	8,500	J	70	S/W, TIP U-401
Elk Mountain Scenic Hwy. (SR 2230)	Beaverdam Road (SR 2053) to Blue Ridge Parkway	6.80	20	60	55	6,000	300	1,800	ADQ	ADQ	
Elkwood Avenue (SR 1674)	Riverside Drive (NC 251) to Weaverville Road (US 25)	1.40	16-20	60	35	9,000	3,200	4,000	ADQ	ADQ	
Emma's Grove Road (SR 3128)	Concord Road (SR 3150) to US 74	3.50	16	—	55	7,500	—	3,000	ADQ	ADQ	
Enka Cove Road (SR 3446)	North Case Cove Road (SR 3437) to South Case Road (SR 3437)	1.80	18	—	35	7,000	—	5,000	ADQ	ADQ	
Evelyn Place	Kimberly Avenue to Murdock Street	0.10	30	40	25	11,000	—	4,500	ADQ	ADQ	
Fanning Bridge Road (SR 3539)	Brevard Road (NC 191) To Airport Road (NC 280)	1.20	18	—	55	7,500	—	3,500	P	70-100	PN #3
	Airport Road (NC 280) To Hendersonville Road (US 25)	1.00	18	—	55	7,500	2,500	5,000	P	70-100	PN #3
Foresthill Drive	Caledonia Road to Kenilworth Drive	0.10	20	40	35	7,500	—	4,100	ADQ	ADQ	
Fairview Road	Sweeten Creek Road (US 25A) to Cedar Street	1.60	21	—	35	9,000	9,900	12,000	P	ADQ	Sidewalks
	Cedar Street to Swannanoa River Road (NC 81)	1.00	46	60-200	45	33,500	13,800	22,000	ADQ	ADQ	Sidewalks
Glen Bridge Road (SR 3495)	Brevard Road (NC 191/280) to Hendersonville Road (US 25)	4.10	16-22	60	55	7,500	—	2,000	ADQ	ADQ	

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Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
Glendale Avenue (SR 3229)	Fairview Road to Swannanoa River Road (NC 81)	0.80	24	—	30	7,500	2,800	4,100	ADQ	ADQ	
Gorman Bridge Road (SR 1357)	Dryman Mtn. Road (SR 1338) to Old Leicester Hwy. (SR 1002)	1.80	16	60	55	22,000	1,600	4,500	ADQ	ADQ	
Grassy Branch Road (SR 2403)	US 70 to Old Farm Sch. Road (SR 2408)	1.40	16	—	35	6,000	1,600	2,900	ADQ	ADQ	
Haywood Street	Flint Street to College Street	0.30	32-36	—	30	7,500	7,000	12,000	Under	Study	Pkg one side
Hazel Mill Road (SR 1333)	Dryman Mtn. Road (SR 1338) to Louisana Avenue (SR 1332)	0.70	16	40	55	7,000	3,200	5,000	Upgrade	100	
	Louisiana Avenue (SR 1332) to Patton Avenue (US 19/23)	0.70	16	40	5	7,000	3,500	11,500	Upgrade	100	
Henry Road (SR 3521)	Glen Bridge Road (SR 3495) to Heywood Road (SR 3552)	0.50	24	60	55	7,500	—	6,700	ADQ	ADQ	
Herron Cove Road (SR 2098)	Elk Mnt. Scenic Hwy. (SR 2230) to Northern Planning Boundary	0.50	20	60	55	6,000	—	1,400	ADQ	ADQ	
Heywood Road (SR 3552)	Henry Road (SR 3521) to US 25	0.30	22	—	35	7,000	—	6,400	ADQ	ADQ	
Hiawassee Street	Haywood Street to Lexington Avenue	0.20	34	60	35	7,000	—	2,000	ADQ	ADQ	
Hillside Street (SR 2128)	Broadway Street (SR 1781) to Charlotte Street	0.90	24	30	35	7,500	3,700	5,000	ADQ	ADQ	
Holbrook Road (SR 1238)	Monte Vista Road (SR 1224) to Starnes Cove Road (SR 1255)	1.00	18	60	55	7,500	1,500	4,200	ADQ	ADQ	
Jenkins Valley Road (SR 1641)	Macedonia Road (SR 1645) to Mt. Carmel Road (SR 1369)	0.60	10	60	55	7,500	—	1,000	P	100	
Johnston Blvd. (SR 1319)	Old County Home Road to Cedar Hill Road	0.90	18	—	55	7,500	1,800	4,000	ADQ	ADQ	
	Cedar Hill Road to Bear Creek Road	0.40	16	—	35	7,500	2,500	4,000	ADQ	ADQ	
	Bear Creek Road to Baker Drive	0.70	18	60	35	7,500	—	5,000	ADQ	ADQ	
	Baker Drive to Patton Avenue	0.30	27	50	35	7,500	3,500	5,000	ADQ	ADQ	
Jonestown Road (SR 1661)	Riverside Drive to Elk Mountain Road	1.80	17	—	25	7,500	—	2,500	ADQ	ADQ	
Kenilworth Road	Foresthill Drive to Tunnel Road	1.30	20-35	40-60	35	10,000	—	4,500	ADQ	ADQ	
Kimberly Avenue	Evelyn Place to Beaverdam Road	1.60	32	60	25	11,000	10,200	22,000	Under	Study	
Lakeshore Drive	Elkwood Avenue to Merrimon Avenue	1.60	32	60	25	9,000	5,500	8,500	ADQ	ADQ	

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
Ledbetter Road (SR 3498)	NC 191/280 to Long Shoals Road (NC 146)	2.10	18-20	60	35	9,000	—	2,000	ADQ	ADQ	
Liberty Street/Crayton Road	Sweeten Creek to Old West Chapel	0.50	24	—	30	7,500	6,900	—	Under	Study	I-100
	Old West Chapel to Fairview Road	0.40	25	—	30	6,500	6,200	—	Under	Study	I-100
Livingston Street	Depot Street to Victoria Road	0.63	33	30	35	18,000	—	12,000	ADQ	ADQ	
Louisiana Avenue (SR 1332)	Haywood Road to Near Oregon Avenue	0.50	24	30	35	10,500	5,500	7,000	ADQ	ADQ	
	Near Oregon Avenue to Patton Avenue	0.10	48	60	35	35,000	5,500	7,000	ADQ	ADQ	
	Patton Avenue to Near Emma Road (SR 1338)	0.60	23	50	35	10,500	8,100	12,000	H	70	TIP U-619
	Near Emma Road (SR 1338) to Bingham Road (SR 1349)	0.60	21	30	35	10,500	5,300	8,000	H	70	TIP U-619
Lower Christ School Road (SR 3197)	Mills Gap Road (SR 3116) to Cane Creek Road (SR 3136)	0.80	20	—	55	7,500	—	3,000	ADQ	ADQ	
Lower Grassy Branch Road (SR 2403)	US 70 to Riceville Road (SR 2002)	2.25	16	—	35	7,500	—	3,000	ADQ	ADQ	
McIntosh Road (SR 3426)	Oakview Road (SR 1224) to Pond Road	0.80	18	50	55	7,500	—	1,500	ADQ	ADQ	
Merrill's Cove Road (SR 3119)	Concord Road (SR 3150) to Pinner's Cove Road (SR 3121)	1.70	14	—	55	5,000	—	1,000	ADQ	ADQ	
Monte Vista Road (SR 1224)	Western Planning Boundary to Acton Circle (SR 1245)	2.70	16	40	35	7,500	4,500	7,000	ADQ	70-100	
Montford Avenue	Haywood Street to Chestnut Street	0.80	40	69	35	7,500-18,000	—	5,200	ADQ	ADQ	
Mount Carmel Road (SR 1369)	Leicester Highway (NC 63) to Old NC 20 (SR 1622)	2.70	18	—	35	6,400	4,300	7,000	P	70-100	
Murdock Avenue	Hillside Street (SR 2128) to Merrimon Avenue (US 25)	0.75	24	40	35	7,500	—	7,500	ADQ	ADQ	
New Haw Creek Road (SR 2032)	US 70/Dillingham Road to Mann Road (SR 2183)	2.70	16-18	—	55	7,500	5,900	6,000	P	100	
Oak Hill Road (SR 1248)	Monte Vista Road (SR 1224) to Starnes Cove Road (SR 1255)	1.20	17	—	35	7,500	—	1,300	ADQ	ADQ	
Oak Street	Woodfin Street to College Street	0.08	48	60	35	22,000	8,400	14,000	ADQ	ADQ	
Oakview Road (SR 1224)	Sand Hill Road (SR 3412) to McIntosh Road (SR 3426)	1.00	16	60	55	7,500	—	1,000	ADQ	ADQ	
Old Beaverdam Creek Road	NC 251/Riverside Drive to Elk Mountain Road (SR 1684)	0.10	18	—	55	7,500	—	2,300	ADQ	ADQ	
Old County Home Road (SR 1315)	Leicester highway (NC 63) to Bear Creek Road (SR 1630)	0.30	16	—	35	6,000	—	3,700	ADQ	ADQ	

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
Old Farm School Road (SR 2402)	Riceville Rd West(SR 2002) to Lower Grassy Branch Rd (SR 2403)	0.70	18-20	---	55	9,500	---	1,600	ADQ	ADQ	
Old Farm School Road (SR 2403)	Lower Grassy Branch Rd (SR 2403) to Riceville Rd East(SR 2002)	1.60	18-20	60	55	9,500	---	1,600	ADQ	ADQ	
Old Haywood Road (SR 1404)	US 19/23 to US 19/23	1.40	20	---	55	7,500	4,100	7,000	P	ADQ	UPGRADE
Old Shoals Road (SR 3522)	Airport Road (SR 3526) to Henry Road (SR 3521)	1.00	20-22	60	55	7,500	---	3,500	ADQ	ADQ	
Olivette Road (SR 1348)	Old Leicester Highway (SR 1002) to Macedonia Road (SR 1645)	0.80	18	---	55	7,500	500	800	ADQ	ADQ	
Overlook Road (SR 3503)	Long Shoals Road (NC 146) to Hendersonville Highway (US 25)	1.80	20	40-60	35	7,500	3,000	~7,600	ADQ	ADQ	Enhanc.
Pearson Bridge Road (SR 1348)	Bingham Heights Road (SR 1349) to River View Road (SR 1353)	0.30	16	---	35	7,000	2,400	3,300	ADQ	ADQ	
	River View Road (SR 1353) to Riverside Drive / NC 251	0.70	24	---	35	11,000	3,500	5,000	ADQ	ADQ	
Pensacola Avenue (SR 3187)	US 25A to Christ School Road (SR 3188)	0.01	20	60	35	7,500	1,000	3,600	ADQ	ADQ	
Phifer Street	South French Broad Avenue to McDowell Street (US 25)	0.19	24	40	35	7,500	---	3,000	ADQ	ADQ	
Pisgah View Road (SR 1403)	Starnes Cove Road (SR 1255) to Cedar Hill Road (SR 1263)	2.10	16	---	35	7,500	2,000	3,000	ADQ	ADQ	
Pole Creasman Road (SR 3479)	Bent Creek Road (SR 3480) to Brevard Road (NC 191)	1.40	20-30	60	35	8,500	2,600	3,000	ADQ	ADQ	
Pond Road (SR 3439)	Sardis Road (NC 112) to Brevard Road (NC 191)	2.00	12	60	55	6,500	200	1,000	ADQ	ADQ	
Queen Road (SR 3447)	NC 151 to Enka Lake Road (SR 3446)	2.59	16-18	---	55	7,500	---	3,000	ADQ	ADQ	
Riceville Road (SR 2002) (see also Major Thoroughfares)	Bull Creek Road (SR 2424) to Warren Wilson College Rd	2.00	16	---	55	7,500	---	7,000	ADQ	ADQ	
Rock Hill Road (SR 3081)	Hendersonville Road (US 25) to Sweeten Creek (US 25A)	0.60	16	---	30	16,000	3,400	5,000	ADQ	ADQ	
Rose Hill Road (SR 3121)	Merrill's Cove Road (SR 3119) to US 74	2.25	16-18	---	55	5,000	---	1,000	ADQ	ADQ	
Rumbough Place	Patton Avenue (US 19/23) to Salola Street	0.38	20	30	35	7,500	---	3,000	ADQ	ADQ	
Sand Hill Road (SR 3412)	Sardis Road (NC 112) to Sand Hill School Road	0.80	20	40	45	9,000	5,100	7,000	ADQ	60	
	Sand Hill School Road to I-40	0.80	20	40	35	9,000	3,600	5,000	ADQ		

Facility	Section	Section Length (Miles)	Rdwy. Width (Ft)	R-O-W (Ft)	Speed Limit (Mph)	Practical Current Capacity	1989 AADT	2020 AADT	RECOMMENDED Rdwy. (Ft)	RECOMMENDED R-O-W (Ft)	Enhance.
	I-40 to Haywood Road	2.30	25	40	35	11,000	2,100	3,000	ADQ	60	
Sandhill School Road (SR 1224)	Acton Circle (SR 1245) to Sand Hill Road (SR 3412)	0.70	21	40	35	7,500	3,000	5,600	ADQ	ADQ	
Salola Street	Rumbough Place to Sand Hill Road	0.33	20	30	35	75,000	—	3,000	ADQ	ADQ	
Shelburne Road	Brevard Road (NC 191) to Sand Hill Road (SR 3412)	0.70	20	30	35	7,000	—	2,000	ADQ	ADQ	
Shope Creek Road (SR 2426)	Bull Creek Road (SR 2419) to Northern Planning Boundary	1.50	16	—	55	6,000	—	2,600	ADQ	ADQ	
Starnes Cove Road (SR 1255)	Northern Planning Boundary to US 19/23	2.80	16	55	—	7,500	3,200	5,600	ADQ	ADQ	
State Street	Amboy Road (SR 3557) to Haywood Road (SR 3552)	1.26	28	40	35	7,500	—	3,000	ADQ	ADQ	
Vanderbilt/Stuyvesant Road	Blue Ridge Pkwy to Hendersonville Road (US 25)	3.70	21	—	35	9,000	—	2,900	ADQ	ADQ	
Warren Wilson College Road (2416)	US 70 to Old Farm School Road	1.30	16-18	60	55	7,500	—	7,000	ADQ	ADQ	
Webb Cove Road (SR 2053)	Beaverdam Road (SR 2053) to Town Mtn. Road (NC 694)	2.40	16	60	45	7,500	1,500	4,000	ADQ	ADQ	
Wesley Branch Road (SR 3484)	Bent Creek Road (SR 3480) to NC 191	1.00	18	60	55	7,500	—	3,000	ADQ	ADQ	
West Chapel Road	Sweeten Creek Road (US 25A) to Caribou Road (SR 3223)	0.66	19	60	30	7,600	—	1,700	ADQ	ADQ	
	Caribou Road (SR 3223) to Hendersonville Highway (US 25)	0.40	20	60	30	7,600	—	1,700	ADQ	ADQ	
Weston Road (SR 3157)	Hendersonville Highway (US 25) to Mills Gap Rd (SR 3116)	2.00	20	—	35	7,500	—	3,700	ADQ	ADQ	
Woodfin Street (SR 1668)	Lexington Avenue to Oak Street	0.50	48	70	35	22,000	8,400	14,000	ADQ	ADQ	

Enh. = Enhancement Project
Mod.1-way = Modified One-Way Pair
PN = Priority Needs List Number
S/W = Sidewalks
TIP = Transportation Improvement Program Project

B. TRAFFIC MODEL ANALYSIS

This section explains the development of the traffic model by detailing each phase of model development. A description of the trip generation model and the trip distribution model is included.

TRANPLAN is the transportation planning software that was used to model the traffic. TRANPLAN was developed in 1988 by The Urban Analysis Group (UAG) in Danville, California and is widely used throughout the United States. UAG also developed NIS, a software program which allows interactive display and editing of networks on the terminal screen. Plots which illustrate network characteristics can be made using NIS and TRANPLAN.

Overview of Model Development

The thoroughfare plan process began with development of the basis of the model and a first opportunity for public involvement. As described in the Chapter 4-Model Development, the planning area, the traffic analysis zones, and the roads to be used in the network were determined. The socioeconomic data was then collected.

The socioeconomic data was then used to produce and attract trips for each zone. This phase is termed trip generation. Once trip generation is complete, the trips ends are assigned between pairs of zones during the trip distribution phase. The outcome of this phase is synthesized traffic volumes. These traffic volumes are termed loaded volumes. The calibration phase then begins which includes adjustment of various factors until the loaded volumes match the traffic counts. This model used an all or nothing assignment procedure for loading calibration.

After the base year model is calibrated, the future year socioeconomic projections that have been provided by the local area are entered into the model. At this time, the analysis of alternate modes of transportation are analyzed. The projections are entered into the model and their impact on traffic volumes is quantified. Traffic is then assigned to the road network based on the projected location of housing and employment. The resulting traffic volumes are compared to the road capacities. The result of this comparison is an illustration of the capacity deficiencies on the road system. After the future year model is complete, the alternatives analysis phase begins. The design year 2020 projections included in Appendix A are based on an existing + committed network.

Trip Generation Models

The number of trips beginning and ending in each zone was generated based on the socioeconomic data. During the trip generation phase, only the number of trips produced and attracted to each zone is determined.

There are three types of trips. Different trip types have different characteristics such as length, purpose, and the impacts of transit and car/vanpooling. **Thru trips** begin and end outside of the planning area. For example, vacationers headed from Hickory to Knoxville would pass through the planning area on I-40. **Internal trips** are trips that begin and end in the planning area. The internal trips are then separated into three purposes: home-based work, other home-based, and non-home based. Non-home based secondary trips, that is, trips generated by vehicles garaged outside the planning area, are also determined. Lastly, **external-internal trips** are trips that have one trip end inside the planning area and one outside the planning area. For example, a person who lives in Hendersonville but travels to work in Fletcher is considered an external-internal trip. Internal trips are impacted by transit and car/vanpooling the most. The external-internal trips are impacted by transit and car/vanpooling to a lesser degree.

The Internal Data Summary (IDS) Program, developed by the NCDOT Statewide Planning Branch was used to estimate internal trip productions and attractions. Trip productions were calculated using generation rates on page B-4. IDS utilizes previously developed multiple regression equations to determine trip productions and attractions for truck and taxi trips. Regression equations are also used to determine the trip attractions for all internal and external trips. The trip attractions were adjusted to meet the trip productions.

Regression Equations

The generic regression equation for trip attractions for home-based other trips, non-home based trips, and external- internal trip purposes is shown below. The home-based work is a special case in that the trip attractions are equal to the total employment for each zone.

Regression Equation

$$\text{Trip Attractions} = aX_1 + bX_2 + cX_3 + dX_4 + eX_5 + fX_6 + gX_7 + hX_8$$

where the X_s represent the following:

X_1 = Industrial Employment (SIC code 1-49)
X_2 = Wholesale/Retail Employment (SIC code 50-54,56,57,59)
X_3 = Highway Retail Employment (SIC code 55,58)
X_4 = Office/Industrial Employment (SIC code 60-67,91-97)
X_5 = Service Employment (SIC Code 70-76,78-89,99)
X_6 = Special (Grove Park Inn)
X_7 = Special (UNC-Asheville)
X_8 = Dwelling Units

Attraction Coefficients

Purpose:	a	b	c	d	e	f	g	h
HBO	0.5	1.83	8.36	2.60	2.55	0.80	5.00	0.5
NHB	0.5	1.83	8.36	2.60	2.55	0.80	5.00	0.1
EXT-INT	0.5	1.83	8.36	2.60	2.55	0.80	5.00	1.0

The differences in the attraction coefficients illustrate the relative attractiveness (and thus number of trips attracted to a zone) of the various types of employment. For example, highway retail employment has a coefficient of 8.36 and industrial employment has a coefficient of 1.0. This difference indicates that highway retail attracts significantly more trips than industrial.

Trip Percentages By Purpose

Based on previous studies analysis determined that trips made in the urban area were 88% internal or internal- external trips. Of these internal trips, 27% were HBW, 49% were OHB, and 24% were NHB. Table B-1 illustrates the percentages of trips.

Table B-1
Trip Percentages by Purpose

Trip Type	Percent of Trips
Internal of Total:	88%
HBW	(27%)
HBO	(49%)
NHB	(24%)

Internal Trip Generation

The internal trip productions were based on applying a trip generation rate to each housing classification collected by LOSRC. Each residence in the planning area was classified according to an excellent, above average, average, below average, or poor rating. Based on these ratings, a corresponding number of trips per residence was estimated. Previous research has shown that generally more trips are produced from residences rated excellent than those rated poor.

Table B-2 shows the dwelling unit trip generation rates that were input into IDS to generate internal trips for both the base and future year. The base year rates resulted in an average trip generation rate of 6.6 trips per dwelling unit. As part of the calibration, the rates were adjusted from initial estimates until calibration was achieved. The screenline checks validate the selected generation rates. The future year trip generation rates were adjusted to reflect changes in the number of vehicles per person and persons per household. As shown below, the 1989 Average Generation Rate (AGR) was multiplied by factors to result in the 2020 AGR:

Calculation of Increase in Trip Generation Rates:

$$\text{Composite Factor} = \frac{\text{1989 Persons/Vehicle}}{\text{2020 Persons/Vehicle}} \times \text{Usage Factor} \times \frac{\text{2020 Person/DU}}{\text{1989 Person/DU}}$$

$$= \frac{1.16}{1.05} \times 1.00 \times \frac{2.38}{2.50}$$

$$= 1.05$$

$$\text{Increase for Generation Rates} = \text{Average 1989 Trip Rate} \times \text{Composite Factor} - \text{Average 1989 Trip Rate}$$

$$= (6.56 \times 1.05) - 656$$

$$= 0.3387 \quad \text{(use 0.30)}$$

Table B-2
Dwelling Unit Trip Generation Rates - Daily

Housing Classification	Base Year Trips/DU	Adjustment/1	Future Year Trips/DU
Excellent	12.0	0.3	12.3
Above Average	10.0	0.3	10.3
Average	8.0	0.3	8.3
Below Average	5.5	0.3	6.5
Poor	4.0	0.3	4.3

Added to these internally generated trips are internal trips that are generated by vehicles garaged outside the planning area, that is non-home based secondary trips (NHBS). A factor of 0.45 determined from data from previous studies was used to calculate the number of NHBS trips. This factor indicates that vehicles garaged outside the planning area and coming into the planning area generate NHBS trips. These trips are added to the internally produced NHB trips and distributed to each zone based on each zone's relative attractiveness as determined from the regression equation. Table B-3 illustrates the total trips for each purpose.

Secondary NHB Trip Equation:

$$\text{Secondary NHB Trips} = 0.45 \times (\text{Total Ext-Int Trips} - \text{Ext-Int Trips Garaged Inside Planning Area})$$

1989: = 0.45 x (227,000 - 48,600)
= 0.45 x (178,400)
= 80,000

2020: = 0.45 x (472,000 - 63,900)
= 0.45 x (408,100)
= 183,600

External and Thru Trip Generation

Traffic counts taken at each external station (zones 354 to 389) were the basis for external and thru trip productions. A new origin-destination study was not conducted as part of this update. Since the planning area boundary is significantly larger than the 1975 planning area, the 1975 thru trip table was adjusted to reflect the larger planning area.

A thru trip table reflects the number of vehicles that pass thru the planning area. In 1967, an origin-destination survey was conducted at the external stations whereby drivers were stopped and asked their origin and destination. The 1975 thru trip table was compiled based on the results of the origin and destination survey. Ideally, another origin and destination survey would have been conducted in the summer of 1989 at the new external stations. Since this was not possible due to fiscal constraints, adjustments were made to the 1975 thru trip table. An estimate of the percent of trips that were at the 1975 external station still at the 1989 external station was made. The estimate was based on (1) the geographic location of new station with respect to the old station, (2) the functional classification of the new versus old station, (3) the land use between the two stations, and (4) the observed trip patterns. A copy of the 1975 planning area and station locations is also included (this can be compared to the current planning area shown in Figure 4).

This information was then input into TRIP VERT in UTPS for conversion to a new trip table (TRANPLAN did not have this option available). The output of TRIP VERT reflected the thru trips which would have occurred in 1975, but on the expanded 1989 boundary. This trip table was then input into FRATAR in TRANPLAN along with external station historical growth rates. This resulted in the 1989 thru trip table.

To project the 1989 thru trip table to 2020, the traffic growth rate that occurred at each station from 1975 to 1990 was calculated. At some stations, there was a decrease in traffic. The rates were then adjusted to reflect plans for additional development or the scaling down of development. For example, SR 2002 has grown at a rate of 14.1% per year since 1975 -from 300 to 1890 vehicles per day. Assuming this rate would continue to 2020, would result in a future forecast of 98,000 vehicles per day. Most likely, is that from 1975 to 1990 some growth

occurred in the immediate area near SR 2002. Since no major developments are expected in the area, the growth that occurred since 1975 is expected to level off. Thus, 14.1% was adjusted to a more reasonable 2.0% per year. From the 1975 to 1990 rate, adjustments were made as necessary to reflect the expected growth from 1990 to 2020 at the external stations. The growth factors were then input into FRATAR which increases the thrutrip table. The output from FRATAR is an estimate of thru trips in 2020 at the external stations. The total trips at a station are made of both thru trips (those trips going thru the planning area) and external-internal trips (those trips beginning outside the planning area but ending in the planning area) and internal-external trips (those trips beginning inside the planning area but ending outside the planning area). The proportion of thru to external-internal trips in 1975 (from the origin-destination survey) was estimated to be the same in 2020.

Transit Trip Generation

Transit is an integral aspect of the transportation system in Asheville. It primarily serves the elderly, handicapped, and low income persons who are dependent upon transit to get to and from work. The local area foresees transit growing at a rate of 1% per 10 years. The local area also pinpointed those zones expected to have the greatest propensity for transit usage. The method used to analyze increased transit usage is explained here.

The Statewide Planning Branch has developed a computer program, Quick Response Transit Impact Analysis (QRTIA). This program reduces the number of trips in specified zones based on the transit propensities, the percent ridership by purpose, and the target ridership. The program was developed in 1981 and in 1991 was updated for use with a personal computer.

The parameters needed to input to QRTIA include propensity ratings for each zone, the percent ridership by purpose, and the target ridership. Chapter 4-Model Development explains the methodology used to arrive at many of the Input Data below. The calculations below determine percent ridership by purpose and the target ridership:

Input Data

1989 ridership = 910,816 riders/year ("Historical Trends", NCDOT/PTD info from Fixed Route Operators)
1989 Daily Riders = 4,000 riders/day (Carl Owenby, Asheville Transit)
Transit Trips, Work Related = 57% (Weslin Consulting, phone survey)
Transit Trips, Non-Work Related = 43% (Weslin Consulting)
1990 Work Trips By Transit = 2.8% (1990 Census)
2020 Work Trips By Transit = 5.8% (LOSRC projections)
1989 Vehicle Occupancy Rate = 1.24 persons/vehicle (LOSRC)
2020 Vehicle Occupancy Rate = 1.27 persons/vehicle (LOSRC)
1989 Internal of Total Trips = 355,000 vehicle trips/day (TRANPLAN)
1989 Home Based Work Trips = 96,106 vehicle trips/day (TRANPLAN)
1989 Non Home Based Trips = 85,427 vehicle trips/day (TRANPLAN)
1989 Other HomeBased Trips = 174,414 vehicle trips/day (TRANPLAN)

Calculation of Percent
Ridership by Purpose (1989)

Convert auto trips to person trips:

HBW: (96,106 vehicle trips)*(1.24 persons/auto) = 119,171 person trips/day
NHB: 85,427 vehicle trips/day = 105,929 person trips/day
OHB: 174,414 " " = 216,273 " "

Work Trips + Non-Work Trips = Average Daily Ridership

Therefore, 57% of 4,000 = 2,280 (work trips)
43% of 4,000 = 1,720 (non-work trips)

= 4,000 Average Daily Ridership

So, 2.8% of HBW person trips should = 2,280
2.8% of 119,171 = 3,337
3,337 does not equal 2,280

These numbers do not match because Statewide Planning defines HBW more broadly than Weslin Consultants or small survey size (218) by Weslin resulted in a low estimate work trip percentage or 2.8% of transit is too high or some combination of the above.

3,337 = x% of 4,000
x% = 0.8343
x = 83%

The remaining trips (4,000 - 3,337 = 663) are NHB and OHB trips. Take 0.205% of NHB and 0.205% OHB to account for the remaining 663 transit trips.

So, to convert to ridership by purpose which adds up to 100%:
(this is the format needed for QRTIA)

2.8% of HBW = 83% of all transit trips are HBW
0.205% of NHB = 6%
0.205% of OHB = 11%

100%

Sideline: this means that 3.21% of all trips utilize transit (i.e. 2.8% + 0.205% + 0.205%)

The last run of QRTIA used 87% HBW, 6% NHB, and 7% OHB.

Calculation of Target
Ridership (2020)

% Switch to Transit = (2020 Transit Work %) - (1989 Transit Work %)

= 5.8% - 2.8%

Switch to Transit = 3.0%

Use proportions to determine NHB and OHB switch

28%/5.0% = 0.205% / x%
x% = 0.425%

When these parameters are input into QRTIA, the appropriate transit trips are reduced from each zone. The HBW, NHB, OHB, and NHBS trips were reduced by 4,000, 0, 1,000, and 1,000 trips respectively. Table 3 illustrates the impact of transit use on the trip totals.

External-Internal Transit Trips

This above analysis does not account for external-internal transit trips. The local projections indicate that shuttle service between Asheville and Black Mountain/Swannanoa and Weaverville is likely. These trips are external-internal trips. The calculations to account for these trips follows:

Input Data

Shuttle service from Asheville to Black Mountain/Swannanoa and Weaverville is likely. It will utilize US 70 and Merrimon Avenue (Business US 19-23).

Calculation of External-Internal
Transit Trips

Since an estimate of ridership was not given, it was estimated that 450 riders utilize the shuttle for each new route (300 riders on US 70 and 150 riders on Merrimon Avenue). The estimate was determined by making the ridership to population ratios equivalent. This assumes the same proportion of projected riders in Asheville as in Black Mountain and Weaverville. This is a very high estimate of transit use in Black Mountain and Weaverville because Asheville has a greater propensity for transit use due to its more dense housing and the shorter travel time involved in using transit. The high estimate was used to illustrate that at even a very optimistic high amount, the impact to the road system is minimal.

Year 2020 Planning Area Populations:

Black Mountain/Montreat	=	11,000
Weaverville	=	4,500
Asheville	=	156,000

Black Mountain/Montreat:

$$\frac{\text{6,000 riders}}{\text{156,000 population}} = \frac{X}{\text{11,000 population}}$$

$$X = \text{400 riders}$$

Weaverville:

$$\frac{\text{6,000 riders}}{\text{156,000 population}} = \frac{X}{\text{4,500 population}}$$

$$X = \text{175 riders}$$

The number of riders was then converted to vehicle trips by applying the vehicle occupancy rate:

Black Mountain: 400 riders * vehicle/1.27 persons = 300 vehicle trips

Weaverville: 175 riders * vehicle/1.27 persons = 150 vehicle trips

Thus, the external-internal trips were reduced by 300 and 150 vehicle trips on US 70 and Merrimon Avenue respectively. Table 3 illustrates the impact of transit on the various types of trips. No change is shown in the external-internal trips because it is rounded to the nearest 1,000.

Car/vanpooling Trip Generation

Car/vanpooling is also an integral part of the transportation system. The amount of car/vanpooling is expressed by the vehicle occupancy rate (VOR). The vehicle occupancy rate is projected to increase from 1.24 persons/vehicle in 1989 to 1.27 persons/vehicle in 2020. This increase in VOR was applied to the internal trips and external- internal trips. As shown in the calculation below, 15,000 trips were reduced from the internal trip table due to the increase in VOR:

(463,000 Internal + 183,000 NHBS) * (1.24 VOR)/(1.27 VOR) = (452,000 Internal + 179,000 NHBS)

A total of 15,000 trips was then reduced by proportion from each zone. Table 3 illustrates the net impact of car/vanpooling.

This analysis illustrates that a slight change in VOR results in an appreciable change in the number of trips. The Technical Coordinating Committee (TCC) and the Transportation Advisory Committee (TAC) urban area have expressed interest in proactive actions to remain a non-attainment area for air quality. Thus, a strong local effort to increase car/vanpooling is one option to reduce the number of vehicle miles of travel (VMT).

Results of Trip Generation Analysis

The result of the trip generation analysis indicates that modest growth is expected for the Asheville urban area. The internal trips are projected to grow at an average rate of 1.3 % per year - from 433,000 trips in 1989 to 631,000 trips in 2020. This is somewhat less than other urban areas in the state such as Hickory, Raleigh, and Winston-Salem which have estimated internal growth rates between 2.5 and 3.5% per year.

The external-internal trips are projected to grow at an average rate of 2.5% per year - from 227,000 trips in 1989 to 472,000 trips in 2020. The thru trips are projected to grow at an average rate of 3.3% per year. The external-internal and thru trips are projected to grow more quickly than the internal trips because they are based on historical trends which indicate more significant growth. The external-internal trips also account for the existence of the I-26 corridor.

Line A in Table 3 represents the 1989 trips simulated by the traffic model. Line B represents the 2020 trips with no adjustment for transit or carpooling. Line C represents the 2020 trips with the subtraction of transit trips. Line D represents the 2020 trips adjusted for both transit and carpooling.

Table 3 - RESULTS OF TRIP GENERATION ANALYSIS

		HBW*	NHB*	OHB*	INTERNAL Total	NHBS*	EXT-INT	THRU	GRAND TOTAL
A	1989:	96,000	85,000	174,000	355,000	80,000	227,000	39,000	699,000
B	2020: Unadjusted	126,000	112,000	230,000	468,000	183,600	472,000	102,000	1,226,000
C	Adjusted: w/Transit	122,000	112,000	229,000	463,000	183,000	**472,000	102,000	1,220,000
D	w/Transit & Car/vanpooling	119,000	109,000	224,000	452,000	179,000	472,000	102,000	1,205,000

* HBW = Home Based Work Trips
NHB = Non Home Based Work Trips
OHB = Other Home Based Work Trips
NHBS = Non Home Based Secondary Trips

** No Change shown for EXT-INT Trips because rounded to the nearest 1,000

APPENDIX B - POPULATION ESTIMATES AND PROJECTIONS BY TAZ 1/4

TAZ	HOUSING CONDITIONS 5 EXCEL	4 ABOVE AVG	3 AVG	2 BELOW AVG	1 POOR	TOTAL DWELLING UNITS	PERSONS PER DWELLING UNIT*	1989 ESTIMATED POPULATION	1989 PERCENT OF TOTAL POPULATION	1890 POPULATION ESTIMATE	2000 POPULATION PROJECTIONS	2010 POPULATION PROJECTIONS	2020 POPULATION PROJECTIONS
1	0	0	0	0	158	158	2.5	395	0.002871488	397	413	427	439
2	0	0	2	13	8	23	2.5	58	0.000432568	59	76	90	101
3	0	0	0	0	0	0	2.5	0	0	2	18	32	44
4	0	0	1	0	0	1	2.5	3	0.000018806	4	21	35	46
5	0	0	0	1	0	1	2.5	3	0.000018806	4	21	35	46
6	0	0	1	2	0	3	2.5	8	0.000056420	9	26	40	61
7	0	0	0	0	0	0	2.5	0	0	2	18	32	44
8	0	0	14	0	0	14	2.5	35	0.000263296	49	199	327	429
9	0	0	4	57	15	76	2.5	190	0.001429323	192	208	222	234
10	0	0	0	0	0	0	2.5	0	0	2	18	32	44
11	0	0	0	0	2	2	2.5	5	0.000037613	7	23	37	49
12	0	0	8	44	2	54	2.5	135	0.001015572	137	153	167	179
13	0	0	0	8	122	130	2.5	325	0.002444895	327	343	357	369
14	0	0	2	64	2	68	2.5	170	0.001278868	172	188	202	214
15	0	0	0	2	0	2	2.5	6	0.000037613	7	23	37	49
16	0	0	0	89	0	89	2.5	223	0.001673813	224	241	255	266
17	0	0	55	88	163	307	2.5	768	0.005773715	769	786	800	811
18	0	1	17	52	36	106	2.5	265	0.001993530	267	283	297	309
19	0	0	0	0	0	0	2.5	0	0	2	18	32	44
20	0	8	18	80	11	117	2.5	293	0.002200406	296	332	363	388
21	16	3	55	319	131	524	2.5	1310	0.009854810	1314	1350	1381	1406
22	0	0	11	32	14	67	2.5	143	0.001071992	144	161	175	186
23	0	1	102	190	3	296	2.5	740	0.005566839	742	758	772	784
24	0	0	15	408	3	426	2.5	1065	0.008011735	1067	1083	1097	1109
25	0	0	42	100	31	173	2.5	433	0.003253592	434	451	465	476
26	0	0	0	1	0	1	2.5	3	0.000018806	4	21	35	46
27	0	0	5	60	216	281	2.5	703	0.005284736	704	721	735	746
28	0	2	59	301	52	414	2.5	1035	0.007786052	1037	1053	1067	1079
29	0	0	71	311	68	450	2.5	1125	0.008463100	1127	1143	1157	1169
30	0	2	126	171	16	315	2.5	788	0.005924170	789	806	820	831
31	0	0	69	362	43	474	2.5	1185	0.008814466	1187	1203	1217	1229
32	1	17	60	33	29	140	2.5	350	0.002632964	352	368	382	394
33	0	10	158	157	6	332	2.5	830	0.006243887	832	848	862	874
34	0	0	2	126	0	128	2.5	320	0.002407282	322	338	352	364
35	0	8	183	232	41	464	2.5	1160	0.008726397	1164	1200	1231	1256
36	1	4	269	648	78	1000	2.5	2500	0.018806890	2502	2518	2532	2544
37	2	50	92	83	2	229	2.5	573	0.004306778	574	591	605	616
38	15	90	270	88	3	466	2.5	1165	0.008764011	1167	1183	1197	1209
39	19	60	87	48	0	214	2.5	535	0.004024674	537	553	567	579
40	3	27	11	0	0	41	2.5	103	0.000771082	104	121	136	146
41	4	19	17	3	0	43	2.5	108	0.000808696	111	152	187	215
42	0	1	1	0	0	2	2.5	5	0.000037613	9	50	85	112
43	0	4	2	2	0	8	2.5	20	0.000150455	34	184	312	414
44	0	7	7	0	0	14	2.5	35	0.000263296	49	199	327	429
45	0	0	25	129	74	228	2.5	570	0.004287971	572	588	602	614
46	7	17	11	0	0	35	2.5	88	0.000658241	91	127	158	183
47	7	32	43	0	0	82	2.5	205	0.001542165	209	245	276	301
48	30	27	9	3	0	69	2.5	173	0.001297675	176	217	252	280
49	7	25	65	8	0	105	2.5	263	0.001974723	266	302	333	358
50	5	23	88	0	1	117	2.5	293	0.002200406	296	332	363	388
51	1	75	76	16	6	174	2.5	435	0.003272399	439	480	515	542
52	1	4	13	4	1	23	2.5	58	0.000432558	61	97	128	153
53	0	6	7	2	0	15	2.5	38	0.000282103	41	82	117	145
54	0	1	5	4	33	43	2.5	108	0.000808696	109	126	140	151
55	0	1	53	3	21	78	2.5	195	0.001466937	197	213	227	239
56	0	7	66	72	23	168	2.5	420	0.003158557	422	438	452	464
57	21	61	85	4	0	171	2.5	428	0.003215978	429	446	460	471
58	8	94	56	3	0	161	2.5	403	0.003027909	404	421	435	446
59	4	80	49	1	0	134	2.5	335	0.002520123	337	353	367	379
60	1	0	131	15	2	149	2.5	373	0.002802226	374	391	405	416
61	0	4	83	13	0	100	2.5	250	0.001880689	254	295	330	357
62	1	3	28	28	4	65	2.5	163	0.001222447	166	207	242	270
63	0	2	53	27	4	86	2.5	215	0.001617392	219	260	295	322
64	0	0	59	67	15	141	2.5	353	0.002651771	354	371	385	396
65	0	0	60	34	22	116	2.5	290	0.002181589	292	308	322	334
66	0	0	79	46	11	136	2.5	340	0.002557737	342	358	372	384
67	1	1	162	179	35	378	2.5	945	0.007109004	947	963	977	989
68	3	23	98	0	0	124	2.5	310	0.002332054	312	328	342	354
69	4	35	101	25	0	165	2.5	413	0.003103137	414	431	445	456
70	3	10	102	20	2	137	2.5	343	0.002576544	344	361	375	386
71	14	50	148	2	0	214	2.5	535	0.004024674	537	553	567	579
72	6	21	8	2	0	37	2.5	93	0.000698565	96	137	172	200
73	0	1	35	77	79	192	2.5	480	0.003610923	482	498	512	524
74	0	0	0	26	2	28	2.5	70	0.000526592	72	88	102	114
75	0	2	100	61	69	222	2.5	555	0.004175129	559	595	626	651
76	0	1	32	38	17	88	2.5	220	0.001655006	224	260	291	316
77	1	3	144	2	0	150	2.5	375	0.002821033	379	415	446	471
78	0	19	234	200	0	453	2.5	1133	0.008519521	1134	1151	1165	1176
79	4	24	177	80	1	286	2.5	715	0.005378770	717	733	747	759
80	4	30	71	0	0	105	2.5	263	0.001974723	264	281	295	306
81	0	0	2	5	1	8	2.5	20	0.000150455	22	38	52	64
82	1	0	101	204	7	313	2.5	783	0.005886556	784	801	815	826
83	11	28	153	64	4	260	2.5	650	0.004889791	652	668	682	694
84	0	0	0	1	1	2	2.5	5	0.000037613	7	23	37	49
85	0	0	13	169	1	183	2.5	458	0.003441661	459	476	490	501
86	0	3	64	73	14	154	2.5	385	0.002896261	387	403	417	429
87	0	53	47	0	0	100	2.5	250	0.001880689	254	290	321	346
88	5	4	3	21	1	34	2.5	85	0.000639434	89	125	156	181
89	0	1	2	0	0	3	2.5	8	0.000056420	11	47	78	103
90	0	0	1	1	0	2	2.5	5	0.000037613	9	45	76	101
91	3	22	69	261	2	357	2.5	893	0.00671406	896	932	963	988
92	0	1	8	3	2	14	2.5	35	0.000263296	37	53	67	79
93	3	116	287	14	1	421	2.5	1053	0.007917701	1056	1097	1132	1160
94	0	32	98	29	0	159	2.5	398	0.002990295	401	442	477	505
95	0	3	8	0	0	11	2.5	28	0.000206875	29	46	60	71
96	0	9	96	32	14	151	2.5	378	0.002839840	381	417	448	473
97	0	1	91	142	110	344	2.5	860	0.006469570	864	905	940	967
98	1	2	219	88	67	377	2.5	943	0.007090197	946	987	1022	1050
99	0	14	121	20	2	157	2.5	393	0.002952681	396	432	463	488
100	1	11	101	260	3	376	2.5	940	0.007071391	944	980	1011	1036
101	0	48	213	254	2	517	2.5	1293	0.009723162	1296	1332	1363	1388
102	0	8	275	105	2	390	2.5	975	0.007334687	979	1015	1046	1071
103	0	1	23	191	6	221	2.5	553	0.004156322	556	597	632	660
104	0	0	44	252	133	429	2.5	1073	0.008068156	1076	1112	1143	1168
105	0	0	123	71	10	204	2.5	510	0.003836605	514	550	581	606
106	0	0	3	249	0	252	2.5	630	0.004739336	632	648	662	674
107	0	4	69	3	0	76	2.5	190	0.001429323	192	208	222	234
108	0	3	157	161	0	311	2.5	778	0.005848943	779	796	810	821
109	0	10	275	14	0	299	2.5	748	0.005623260	749	766	780	791
110	0	0	42	85	43	170	2.5	425	0.003197171	427	443	457	469
111	0	13	137	20	27	197	2.5	493	0.003704957	494	511	525	536
112	0	13	118	16	11	158	2.5	395	0.002971488	397	413	427	439
113	0	3	88	16	0	107	2.5	268	0.002012337	269	286	300	311
114	0	1	1	0	0	2	2.5	5	0.000037613	7	23	37	49

APPENDIX B - POPULATION ESTIMATES AND PROJECTIONS BY TAZ 2/4

TAZ	HOUSING CONDITIONS 5 EXCEL	4 ABOVE AVG	3 AVG	2 BELOW AVG	1 POOR	TOTAL MINUS CONDEMN	PERSONS PER DWELLING UNIT*	1989 ESTIMATED POPULATION	1989 PERCENTAGE OF TOTAL POPULATION	1990 POPULATION ESTIMATE	2000 POPULATION PROJECTIONS	2010 POPULATION PROJECTIONS	2020 POPULATION PROJECTIONS
115	0	0	63	34	1	98	2.5	245	0.001843075	247	263	277	289
116	0	0	2	256	0	258	2.5	645	0.004852177	649	690	725	752
117	0	2	16	8	1	27	2.5	68	0.000507786	69	86	100	111
118	0	3	63	16	1	83	2.5	208	0.001560971	211	247	278	303
119	0	1	73	89	2	165	2.5	413	0.003103137	414	431	445	456
120	0	5	200	62	0	267	2.5	668	0.005021439	669	686	700	711
121	0	0	4	2	0	6	2.5	15	0.000112841	17	33	47	59
122	0	0	0	17	4	21	2.5	53	0.000394944	54	71	85	96
123	0	0	35	69	173	267	2.5	668	0.005021439	669	686	700	711
124	0	0	0	0	0	0	2.5	0	0	0	0	0	0
125	0	0	0	101	0	101	2.5	253	0.001899496	254	271	285	296
126	0	1	23	54	3	81	2.5	203	0.001523358	204	221	236	246
127	0	1	60	242	21	314	2.5	785	0.005905363	787	803	817	829
128	0	1	131	127	4	263	2.5	658	0.004946212	659	676	690	701
129	0	1	84	98	5	198	2.5	496	0.003723764	497	513	527	539
130	0	0	7	0	0	7	2.5	18	0.000131648	19	36	50	61
131	0	0	0	0	0	0	2.5	0	0	2	18	32	44
132	0	0	0	0	0	0	2.5	0	0	4	40	71	96
133	0	4	122	50	25	201	2.5	503	0.003780185	506	542	573	598
134	0	1	11	11	134	157	2.5	393	0.002952681	396	432	463	488
135	0	0	16	15	0	31	2.5	78	0.000583013	79	96	110	121
136	0	0	9	158	9	176	2.5	440	0.003310012	442	458	472	484
137	0	0	0	0	0	0	2.5	0	0	0	0	0	0
138	0	0	133	118	2	253	2.5	633	0.004758143	634	651	665	676
139	0	0	59	42	47	148	2.5	370	0.002783419	374	410	441	466
140	1	42	121	51	32	247	2.5	618	0.004645302	621	657	688	713
141	9	18	122	17	15	181	2.5	453	0.003404047	456	492	523	548
142	2	1	0	0	0	3	2.5	8	0.000060420	9	26	40	51
143	0	2	84	85	9	180	2.5	450	0.003385240	452	468	482	494
144	0	0	51	137	21	209	2.5	523	0.003930640	524	541	555	566
145	0	0	1	40	3	44	2.5	110	0.000827503	112	128	142	154
146	0	1	108	115	62	286	2.5	715	0.005378770	719	756	786	811
147	0	0	6	1	0	7	2.5	18	0.000131648	19	36	50	61
148	1	0	4	3	0	8	2.5	20	0.000150455	22	38	52	64
149	0	1	31	130	273	435	2.5	1088	0.008180997	1089	1106	1120	1131
150	1	0	4	1	0	6	2.5	15	0.000112841	17	33	47	59
151	32	46	36	2	0	116	2.5	290	0.002181599	292	308	322	334
152	35	147	58	1	0	241	2.5	603	0.004532460	604	621	635	646
153	0	1	99	132	23	255	2.5	638	0.004795757	639	656	670	681
154	0	0	18	53	16	87	2.5	218	0.001636199	219	236	250	261
155	0	0	26	6	9	40	2.5	100	0.000752275	104	145	180	207
156	0	0	9	0	2	11	2.5	28	0.000206875	29	46	60	71
157	0	8	54	19	23	104	2.5	260	0.001955816	264	305	340	367
158	0	1	24	19	12	56	2.5	140	0.001053185	144	185	220	247
159	0	0	141	114	23	278	2.5	695	0.005226315	697	713	727	738
160	0	0	30	64	204	298	2.5	745	0.005604453	747	763	777	789
161	0	0	0	0	0	0	2.5	0	0	0	0	0	0
162	0	0	0	1	0	1	2.5	3	0.000018806	4	21	35	46
163	14	51	19	0	1	85	2.5	213	0.001598585	214	231	245	256
164	3	19	33	6	1	62	2.5	155	0.001166027	157	173	187	199
165	0	1	25	76	15	117	2.5	293	0.002200406	294	311	325	336
166	0	2	152	29	17	200	2.5	500	0.003761378	504	540	571	596
167	0	1	4	1	0	6	2.5	15	0.000112841	17	33	47	59
168	0	2	34	19	4	59	2.5	148	0.001109606	151	192	227	255
169	11	40	10	2	0	63	2.5	158	0.001184834	161	202	237	265
170	7	67	28	8	2	112	2.5	280	0.002106371	282	298	312	324
171	0	1	7	0	0	8	2.5	20	0.000150455	24	60	91	116
172	0	4	4	0	0	8	2.5	20	0.000150455	24	60	91	116
173	0	0	17	4	4	25	2.5	63	0.000470172	66	107	142	170
174	0	0	0	0	0	0	2.5	0	0	0	0	0	0
175	0	6	6	2	1	15	2.5	38	0.000282103	39	56	70	81
176	0	3	151	16	1	171	2.5	428	0.003215978	431	472	505	533
177	0	3	475	332	9	819	2.5	2048	0.015402843	2049	2066	2080	2091
178	16	138	129	215	10	508	2.5	1270	0.009553900	1274	1310	1341	1366
179	0	1	23	27	11	62	2.5	155	0.001166027	157	173	187	199
180	0	6	83	12	9	120	2.5	300	0.002256826	304	340	371	396
181	0	0	50	68	42	180	2.5	450	0.003385240	454	490	521	546
182	0	1	17	30	39	87	2.5	218	0.001636199	221	257	288	313
183	3	12	300	45	25	385	2.5	963	0.007240653	966	1002	1033	1056
184	0	1	13	8	4	26	2.5	65	0.000488979	69	105	136	161
185	0	0	49	316	17	382	2.5	955	0.007184232	958	996	1026	1051
186	0	0	30	72	27	129	2.5	323	0.002426088	326	362	393	416
187	0	1	54	8	2	65	2.5	163	0.001222447	166	207	242	270
188	0	0	41	157	22	220	2.5	550	0.004137516	552	568	582	594
189	0	2	39	68	41	170	2.5	425	0.003197171	427	443	457	469
190	0	0	0	55	165	220	2.5	550	0.004137516	552	568	582	594
191	0	0	7	34	17	58	2.5	145	0.001090799	147	163	177	189
192	0	1	29	0	0	30	2.5	75	0.000564206	77	93	107	119
193	0	2	37	33	11	83	2.5	208	0.001560971	209	226	240	251
194	0	0	31	31	11	73	2.5	183	0.001372903	184	201	215	225
195	0	1	2	5	0	8	2.5	20	0.000150455	22	38	52	64
196	0	1	78	168	32	279	2.5	698	0.005247122	699	716	730	741
197	0	3	99	120	35	257	2.5	643	0.004833370	644	661	675	686
198	0	0	26	94	21	141	2.5	353	0.002651771	354	371	385	396
199	0	0	81	174	19	274	2.5	685	0.005153088	687	703	717	729
200	0	1	54	135	9	199	2.5	498	0.003742571	499	516	530	541
201	0	2	134	203	19	358	2.5	895	0.006732966	897	913	927	939
202	0	1	152	69	0	242	2.5	605	0.004551267	607	623	637	649
203	0	3	136	148	1	288	2.5	720	0.005416384	722	738	752	764
204	0	0	122	326	7	455	2.5	1138	0.008557135	1139	1156	1170	1181
205	0	2	72	140	24	238	2.5	595	0.00447604	597	613	627	639
206	0	0	32	78	243	353	2.5	883	0.006638832	884	901	915	926
207	0	0	16	71	6	93	2.5	233	0.001749040	234	251	265	276
208	0	2	21	14	28	65	2.5	163	0.001222447	166	207	242	270
209	0	0	0	0	0	0	2.5	0	0	0	0	0	0
210	0	0	33	30	12	75	2.5	188	0.001410516	189	206	220	231
211	0	0	1	0	2	3	2.5	8	0.000060420	9	26	40	51
212	0	0	13	8	6	27	2.5	68	0.000507786	71	107	138	163
213	0	0	17	30	0	47	2.5	118	0.000883923	119	136	150	161
214	0	0	11	30	36	77	2.5	193	0.001448130	196	232	263	288
215	0	1	79	32	10	122	2.5	305	0.002294440	307	323	337	349
216	0	0	1	1	0	2	2.5	5	0.000037613	7	23	37	49
217	0	0	1	1	2	4	2.5	10	0.000075227	12	28	42	54
218	0	0	5	54	6	65	2.5	163	0.001222447	166	202	233	258
219	0	6	80	36	53	175	2.5	438	0.003291205	439	456	470	481
220	0	0	2	7	12	21	2.5	53	0.000394944	54	71	85	96
221	0	1	30	19	76	128	2.5	320	0.002407282	322	338	352	364
222	0	0	0	0	0	0	2.5	0	0	0	0	0	0
223	0	0	1	0	1	2	2.5	5	0.000037613	7	23	37	49
224	1	11	111	38	28	189	2.5	473	0.003564502	476	517	552	580
225	0	1	75	27	69	162	2.5	405	0.003046716	409	450	485	512
226	0	1	221	66	66	344	2.5	860	0.006469670	864	900	931	956
227	0	6	210	226	6	450	2.5	1125	0.008463100	1127	1143	1157	1169
228	0	0	39	20	4	63	2.5	158	0.001184834	159	176	190	201
229	0	1	75	14	0	90	2.5	225	0.001692620	227	243	257	268
230	0	0	1	1	0	2	2.5	5	0.000037613	7	23	37	49

APPENDIX B - POPULATION ESTIMATES AND PROJECTIONS BY TAZ 3/4

TAZ	HOUSING CONDITIONS 5 EXCEL	4 ABOVE AVG	3 AVG	2 BELOW AVG	1 POOR	TOTAL MINUS CONDEMN	PERSONS PER DWELLING UNIT*	1989 ESTIMATED POPULATION	1989 PERCENTAGE OF TOTAL POPULATION	1990 POPULATION ESTIMATE	2000 POPULATION PROJECTIONS	2010 POPULATION PROJECTIONS	2020 POPULATION PROJECTIONS
231	0	1	168	225	7	401	2.5	1003	0.007541563	1004	1021	1035	1046
232	0	0	2	3	0	5	2.5	13	0.000094034	14	31	45	56
233	0	0	32	18	36	86	2.5	215	0.001617392	219	255	286	311
234	0	1	105	121	56	283	2.5	708	0.005322350	711	747	778	803
235	0	0	50	39	215	304	2.5	760	0.005717294	764	800	831	856
236	0	0	33	15	0	48	2.5	120	0.000902730	124	160	191	216
237	0	0	28	202	39	269	2.5	673	0.005059053	676	712	743	768
238	0	1	57	136	23	227	2.5	568	0.004269164	571	607	638	663
239	0	1	63	28	4	96	2.5	240	0.001805461	242	258	272	284
240	0	5	231	144	11	391	2.5	978	0.007353494	979	996	1010	1021
241	0	5	152	250	12	419	2.5	1048	0.007880087	1049	1066	1080	1091
242	0	0	70	53	61	184	2.5	460	0.003460467	464	500	531	556
243	0	0	121	125	40	286	2.5	715	0.005378770	719	755	786	811
244	0	4	294	84	21	403	2.5	1008	0.007579177	1011	1047	1078	1103
245	0	0	66	15	10	91	2.5	228	0.001711427	229	246	260	271
246	0	0	42	119	56	217	2.5	543	0.004081095	544	561	575	586
247	0	2	99	176	15	292	2.5	730	0.005491612	734	770	801	826
248	3	21	165	28	31	248	2.5	620	0.004664108	622	638	652	664
249	0	7	248	684	5	944	2.5	2360	0.017753705	2362	2378	2392	2404
250	0	2	30	2	0	34	2.5	85	0.000639434	87	103	117	129
251	0	0	20	21	63	104	2.5	260	0.001955916	262	278	292	304
252	0	8	99	86	32	225	2.5	563	0.004231550	566	607	642	670
253	0	0	17	48	2	67	2.5	168	0.001260061	171	207	238	263
254	0	14	49	56	20	139	2.5	348	0.002614157	349	366	380	391
255	0	3	160	42	5	210	2.5	525	0.003949447	529	565	596	621
256	0	0	0	0	0	0	2.5	0	0	0	0	0	0
257	0	3	36	5	0	45	2.5	113	0.000846310	116	152	183	208
258	0	0	82	0	0	82	2.5	205	0.001542165	207	223	237	249
259	0	0	2	5	1	8	2.5	20	0.000150455	22	38	52	64
260	0	0	84	95	41	221	2.5	553	0.004156322	554	571	585	596
261	0	0	0	0	0	0	2.5	0	0	0	0	0	0
262	0	0	0	0	0	0	2.5	0	0	0	0	0	0
263	0	0	0	0	0	0	2.5	0	0	2	18	32	44
264	0	0	0	0	0	0	2.5	0	0	2	18	32	44
265	0	0	0	11	3	14	2.5	35	0.000263296	37	53	67	79
266	0	0	0	24	4	28	2.5	70	0.000526592	72	88	102	114
267	0	0	1	11	25	37	2.5	93	0.000695655	94	111	125	136
268	0	0	2	1	1	4	2.5	10	0.000075227	12	28	42	54
269	0	2	20	17	38	78	2.5	195	0.001466937	197	213	227	239
270	0	9	41	129	85	264	2.5	660	0.004965019	664	700	731	756
271	0	4	2	0	0	6	2.5	15	0.000112841	17	33	47	59
272	0	17	25	0	0	42	2.5	105	0.000789689	109	150	185	212
273	0	1	6	1	0	8	2.5	20	0.000150455	24	65	100	127
274	1	23	40	0	10	74	2.5	185	0.001391709	189	225	256	281
275	0	2	33	29	16	80	2.5	200	0.001504561	204	240	271	296
276	0	5	116	87	64	272	2.5	680	0.005115474	684	725	760	787
277	1	9	24	13	5	52	2.5	130	0.000977958	134	162	197	225
278	1	12	38	6	1	58	2.5	145	0.001090799	149	185	216	241
279	0	1	37	79	23	140	2.5	350	0.002632964	352	368	382	394
280	0	1	40	52	10	113	2.5	283	0.002125178	284	301	315	326
281	0	0	8	9	4	21	2.5	53	0.000394944	56	97	132	160
282	0	1	45	32	17	95	2.5	238	0.001786654	241	282	317	345
283	0	1	70	59	30	160	2.5	400	0.003009102	404	445	480	507
284	0	4	15	23	11	53	2.5	133	0.000996765	136	177	212	240
285	1	5	115	33	54	210	2.5	525	0.003949447	529	570	605	632
286	2	16	292	106	10	426	2.5	1065	0.008011735	1069	1110	1145	1172
287	4	84	556	113	15	771	2.5	1928	0.014500112	1929	1946	1960	1971
288	2	105	522	55	21	705	2.5	1763	0.013258858	1766	1807	1842	1870
289	0	21	103	9	2	135	2.5	338	0.002538930	341	382	417	445
290	0	2	31	14	22	69	2.5	173	0.001297675	174	191	205	215
291	0	4	39	23	13	79	2.5	198	0.001485744	199	216	230	241
292	0	16	164	66	42	288	2.5	720	0.005416384	722	738	752	764
293	0	12	42	13	23	90	2.5	225	0.001692620	229	265	296	321
294	0	2	5	2	1	10	2.5	25	0.000188068	27	43	57	69
295	0	0	83	68	95	246	2.5	615	0.004626495	617	633	647	659
296	0	3	5	10	21	39	2.5	98	0.000733468	99	116	130	141
297	0	1	22	46	63	132	2.5	330	0.002482509	332	348	362	374
298	0	1	9	19	19	48	2.5	120	0.000902730	122	138	152	164
299	0	2	70	84	82	238	2.5	595	0.00447604	597	613	627	639
300	0	3	163	125	56	347	2.5	868	0.006525981	871	907	938	963
301	0	0	50	71	269	390	2.5	975	0.007334687	977	993	1007	1019
302	0	4	200	21	7	232	2.5	580	0.004363188	582	598	612	624
303	0	0	4	42	123	169	2.5	423	0.003178364	424	441	455	466
304	1	4	88	57	39	189	2.5	473	0.003554502	474	491	505	516
305	0	5	94	90	43	232	2.5	580	0.004363198	582	598	612	624
306	5	12	219	140	11	387	2.5	968	0.007278266	971	1007	1038	1063
307	0	0	2	0	1	3	2.5	8	0.000056420	9	26	40	51
308	0	0	0	1	0	1	2.5	3	0.000018806	4	21	35	46
309	0	0	0	0	0	0	2.5	0	0	0	0	0	0
310	0	0	0	0	0	0	2.5	0	0	0	0	0	0
311	0	0	0	0	0	0	2.5	0	0	0	0	0	0
312	0	0	29	20	66	115	2.5	288	0.002152792	289	306	320	331
313	0	0	166	38	40	244	2.5	610	0.004588881	624	774	902	1004
314	0	2	40	6	7	55	2.5	138	0.001034379	152	301	429	531
315	0	2	2	0	1	5	2.5	13	0.000094034	14	31	45	56
315	1	4	30	7	30	72	2.5	180	0.001354096	182	198	212	224
317	0	1	10	1	2	14	2.5	35	0.000263296	49	199	327	429
318	0	1	25	22	46	94	2.5	235	0.001757847	237	253	267	279
319	0	1	12	4	1	18	2.5	45	0.000338524	47	63	77	89
320	0	10	11	9	3	33	2.5	83	0.000620627	84	101	115	126
321	0	1	105	25	21	152	2.5	380	0.002858647	382	398	412	424
322	0	0	134	3	3	140	2.5	350	0.002632964	352	368	382	394
323	0	1	25	19	23	68	2.5	170	0.001278868	174	210	241	266
324	0	2	63	33	71	169	2.5	423	0.003178364	426	467	500	528
325	0	0	0	0	0	0	2.5	0	0	0	0	0	0
326	0	0	0	0	0	0	2.5	0	0	0	0	0	0
327	0	0	0	0	0	0	2.5	0	0	0	0	0	0
328	0	0	0	0	0	0	2.5	0	0	2	18	32	44
329	0	0	0	0	0	0	2.5	0	0	0	0	0	0
330	0	4	397	39	85	525	2.5	1313	0.009873617	1314	1331	1345	1356
331	0	0	2	2	3	7	2.5	18	0.000131648	19	35	50	61
332	0	0	3	6	1	10	2.5	25	0.000188068	27	43	57	69
333	0	0	0	0	0	0	2.5	0	0	0	0	0	0
334	0	0	0	0	0	0	2.5	0	0	0	0	0	0
335	0	0	0	0	0	0	2.5	0	0	0	0	0	0
336	0	3	70	45	16	134	2.5	335	0.002520123	339	375	406	431
337	0	0	21	4	0	25	2.5	63	0.000470172	64	81	95	106
[illegible]	0	0	57	28	21	116	2.5	290	0.002181599	292	308	322	334
	0	15	106	20	92	233	2.5	583	0.004382005	586	622	653	678
	0	2	50	52	121	225	2.5	563	0.004231550	564	581	595	606
	0	3	21	24	22	70	2.5	175	0.001316482	179	220	256	282
	1	14	148	9	0	171	2.5	428	0.003215978	431	472	507	535
		7	70	25	12	114	2.5	285	0.002143985	289	325	356	381
		12	135	11	4	162	2.5	405	0.003046716	409	445	476	501
		2	80	4	3	90	2.5	225	0.001692620	229	265	296	321
		7	143	37	30	217	2.5	543	0.004081095	546	582	613	638

APPENDIX B - POPULATION ESTIMATES AND PROJECTIONS BY TAZ 4/4

TAZ	HOUSING CONDITIONS 6 EXCEL	4 ABOVE AVG	3 AVG	2 BELOW AVG	1 POOR	TOTAL MINUS CONDEMN	PERSONS PER DWELLING UNIT*	1989 ESTIMATED POPULATION	1989 PERCENTAGE OF TOTAL POPULATION	1990 POPULATION ESTIMATE	2000 POPULATION PROJECTIONS	2010 POPULATION PROJECTIONS	2020 POPULATION PROJECTIONS
347	0	6	46	30	13	95	2.5	238	0.001786654	241	282	317	345
348	0	0	30	15	17	62	2.5	155	0.001166027	158	200	235	262
349	0	5	10	11	2	28	2.5	70	0.000526592	72	88	102	114
350	0	0	15	8	6	29	2.5	73	0.000545389	74	91	105	116
351	0	0	23	28	20	71	2.5	178	0.001335289	179	196	210	221
352	0	23	408	55	73	559	2.5	1398	0.010513052	1399	1416	1430	1441
353	0	3	72	90	83	248	2.5	620	0.004664108	624	660	691	716
TOTAL	373	2703	22147	20207	7737	53172	2.5	132930	1	133784	142628	150213	156272

*1990 Census

SOURCE: Transportation/Land Use Survey, summer 1989 and Land-of-Sky Regional Council

APPENDIX B - EMPLOYMENT ESTIMATES & PROJECTIONS BY TAZ 1/8

TAZ	BUSINESS GROUP	1991 FULL	PART	TOTAL	2000 FULL	PART	TOTAL	2010 FULL	PART	TOTAL	2020 FULL	PART	TOTAL	TAZ	1991-2020 NET CHANGE	TOTAL BY TAZ
1	1	29	4	33	32	4	36	34	5	39	37	5	42	1	9	
1	2	18	15	33	20	17	37	22	18	40	23	19	42	1	9	
1	3	3	4	7	3	4	7	4	5	9	4	5	9	1	2	
1	4	22	5	27	24	5	28	26	6	32	28	7	35	1	8	
1	5	78	124	202	88	140	228	85	151	246	102	163	265	1	63	91
2	1	24	4	28	26	4	30	28	4	32	30	5	35	2	7	
2	2	69	12	81	78	14	93	84	14	98	89	15	104	2	23	
2	3	15	8	23	17	8	26	18	10	28	19	10	29	2	6	
2	4	5	1	6	5	1	6	6	1	7	7	1	8	2	2	
2	5	48	7	55	55	8	63	58	8	66	63	9	72	2	17	55
3	1	13	3	16	14	3	17	15	3	18	16	4	20	3	4	
3	2	78	16	94	87	18	105	93	18	112	99	20	119	3	25	
3	3	7	0	7	8	0	8	8	0	8	9	0	9	3	2	
3	4	202	20	222	224	22	246	239	24	263	254	25	279	3	57	
3	5	149	8	157	168	9	177	181	10	191	194	10	204	3	47	135
4	1	77	0	77	85	0	85	91	0	91	97	0	97	4	20	
4	2	46	9	55	52	10	62	56	11	67	59	11	70	4	15	
4	3	35	11	46	39	12	51	41	13	54	44	14	58	4	12	
4	4	263	21	284	291	23	314	311	25	336	332	26	358	4	74	
4	5	201	6	207	226	7	233	244	7	251	263	8	271	4	64	186
5	1	6	0	6	6	0	6	7	0	7	7	0	7	5	1	
6	3	11	1	12	12	1	13	13	1	14	14	1	15	5	3	
5	4	266	36	302	292	40	332	315	42	357	336	45	381	5	79	
5	5	120	15	135	134	17	151	146	18	164	157	20	177	5	42	125
6	1	195	0	195	216	0	216	230	0	230	246	0	246	6	51	
6	2	74	14	88	86	16	102	81	17	108	88	18	117	6	29	
6	3	11	6	17	12	7	18	13	7	20	14	8	22	6	5	
6	4	121	7	128	134	8	142	144	8	152	153	9	162	6	34	
6	5	84	32	116	85	36	131	102	38	141	110	42	152	6	36	155
7	1	12	8	20	13	9	22	14	8	23	15	10	25	7	5	
7	2	97	45	142	108	50	158	116	54	170	124	58	182	7	40	
7	3	17	15	32	18	17	36	20	19	38	22	18	41	7	9	
7	4	19	4	23	21	4	25	22	5	27	25	5	30	7	7	
7	5	93	78	172	105	89	194	113	96	209	122	104	226	7	54	115
8	1	16	5	21	18	6	24	18	6	25	21	6	27	8	6	
8	2	78	41	119	87	46	133	93	49	142	100	53	153	8	34	
8	3	38	8	46	42	9	51	45	9	54	48	10	58	8	12	
8	4	35	28	63	39	31	70	41	33	74	45	36	81	8	18	
8	5	94	17	111	106	18	125	114	21	135	123	22	145	8	34	104
9	1	13	1	14	14	1	15	16	1	17	16	1	17	9	3	
9	2	29	8	37	33	8	42	35	10	45	37	10	47	9	10	
9	3	76	22	98	85	25	110	91	26	117	87	28	125	9	27	
9	4	156	13	168	174	15	188	186	15	201	198	17	215	9	46	
9	5	870	132	1002	988	150	1138	1065	162	1227	1148	174	1322	9	320	406
10	1	47	0	47	50	0	50	53	0	53	56	0	56	10	9	
10	2	6	2	8	8	3	11	8	3	11	9	3	12	10	4	
10	3	60	25	85	67	28	95	71	30	101	76	32	108	10	23	
10	4	850	83	933	946	82	1038	1010	98	1108	1079	105	1184	10	251	
10	5	7	3	10	8	3	11	9	4	13	9	4	13	10	3	260
11	1	4	0	4	6	0	6	6	0	6	6	0	6	11	2	
11	2	3	0	3	4	0	4	5	0	5	5	0	5	11	2	
11	5	2	1	3	3	1	4	3	2	5	3	2	5	11	2	6
12	1	36	4	40	40	4	44	42	5	47	46	5	51	12	11	
12	2	59	2	61	74	2	76	78	2	80	84	3	87	12	26	
12	3	4	3	7	4	3	7	5	4	9	5	4	9	12	2	
12	4	5	0	5	6	0	6	6	0	6	6	0	6	12	1	
12	5	77	8	85	87	9	96	94	10	104	102	11	113	12	28	68
13	1	477	2	479	527	2	529	563	2	565	602	3	605	13	126	
13	2	0	2	2	0	2	2	0	2	2	0	3	3	13	1	
13	3	5	5	10	6	6	12	6	6	12	6	6	12	13	2	
13	4	1043	0	1043	1158	0	1158	1236	0	1236	1322	0	1322	13	279	
13	5	5	7	12	6	8	14	6	8	14	7	9	16	13	4	412
14	2	52	0	52	58	0	58	62	0	62	67	0	67	14	15	
14	3	17	1	18	19	1	20	20	1	21	22	1	23	14	5	
14	4	21	0	21	23	0	23	25	0	25	27	0	27	14	6	
14	5	124	74	198	140	84	224	151	90	241	163	97	260	14	62	88
15	1	8	2	10	9	2	11	9	2	11	10	2	12	15	2	
15	2	96	16	112	115	19	134	124	21	145	132	22	154	15	42	
15	3	8	2	10	9	2	11	10	2	12	10	3	13	15	3	
15	4	42	3	45	48	3	51	51	4	55	55	4	59	15	14	
15	5	81	11	92	93	13	106	100	14	114	108	15	123	15	31	92
16	1	169	0	169	187	0	187	198	0	198	212	0	212	16	43	
16	2	79	9	88	94	11	105	101	11	112	109	12	121	16	33	
16	3	76	11	87	85	12	97	90	13	103	97	14	111	16	24	
16	4	39	3	42	43	3	46	46	3	49	50	4	54	16	12	
16	5	225	21	246	255	24	279	275	26	301	296	28	324	16	78	190
17	1	175	4	179	193	4	197	207	5	212	220	5	225	17	46	
17	2	28	8	37	35	10	45	37	10	47	40	11	51	17	14	
17	3	2	0	2	2	0	2	2	0	2	3	0	3	17	1	
17	4	137	5	142	153	5	158	163	6	169	175	6	181	17	39	
17	5	306	58	364	346	66	412	373	71	444	402	76	478	17	114	214
18	1	89	3	92	98	3	102	105	3	108	112	3	115	18	23	
18	2	14	1	15	17	1	18	18	1	18	20	1	21	18	6	
18	3	43	0	43	48	0	48	51	0	51	55	0	55	18	12	
18	4	4	2	6	2	1	3	2	1	3	3	1	4	18	-2	
18	5	32	6	38	36	7	43	39	7	46	42	8	50	18	12	51
19	1	214	9	222	234	8	242	248	9	257	264	9	273	19	51	
18	2	28	5	33	33	6	38	36	6	42	38	7	45	19	12	
19	4	320	12	332	354	13	367	379	14	393	405	16	421	19	88	
19	5	515	31	546	580	35	615	626	38	664	675	41	716	19	170	322
20	1	7	1	8	9	1	8	8	1	9	9	1	10	20	2	
20	4	50	2	52	56	2	58	60	2	62	64	3	67	20	15	
20	5	43	8	51	49	9	58	53	10	63	57	11	68	20	17	34
21	1	2	0	2	2	0	2	2	0	2	2	0	2	21	0	
21	2	21	4	25	24	4	28	26	5	31	27	5	32	21	7	
21	3	6	2	8	7	2	9	7	2	8	8	3	11	21	3	
21	4	230	16	246	256	18	274	274	19	293	292	20	312	21	66	
21	5	30	3	33	34	3	37	37	4	41	38	4	43	21	10	86
22	2	3	0	3	4	0	4	4	0	4	4	0	4	22	1	
22	3	13	7	20	16	9	25	17	9	26	18	10	28	22	8	
22	5	38	10	48	47	12	58	51	13	64	54	14	68	22	20	29
23	2	53	5	59	67	6	73	72	7	79	76	7	83	23	25	
23	4	13	1	14	14	1	15	15	1	16	17	1	18	23	4	
23	5	224	15	239	257	17	274	276	18	295	298	20	318	23	79	108
24	4	5	1	6	6	1	7	6	1	7	7	1	8	24	2	
24	5	33	7	40	39	8	47	42	9	51	45	10	55	24	15	17
25	2	29	3	32	32	3	35	35	4	39	37	4	41	25	9	
25	3	3	2	5	3	2	5	4	2	6	4	3	7	25	2	
25	4	20	7	27	13	3	16	14	3	17	15	4	19	25	-8	
25	5	760	95	855	858	107	965	925	116	1041	997	125	1122	25	267	270
26	1	47	0	47	50	0	50	53	0	53	56	0	56	26	9	
26	3	81	1	82	90	1	91	96	1	97	102	1	103	26	21	
26	5	904	421	1325	1018	474	1492	1097	511	1608	1183	551	1734	26	409	439
27	1	9	0	9	10	0	10	11	0	11	12	0	12	27	3	
27	3	6	1	7	7	1	8	7	1	8	8	1	9	27	2	
27	4	3	2	5	3	2	5	4	2	6	4	3	7	27	2	
27	5	41	4	45	48	5	53	52	5	57	55	5	60	27	15	22
28	2	10	3	13	12	4	16	13	4	17	13	4	17	28	4	
28	3	9	15	24	10	17	27	11	19	30	12	20	32	28	8	
28	4	4	0	4	5	0	5	5	0	5	5	0	5	28	1	

TAZ	BUSINESS GROUP	1991 FULL	PART	TOTAL	2000 FULL	PART	TOTAL	2010 FULL	PART	TOTAL	2020 FULL	PART	TOTAL	TAZ	1991-2020 NET CHANGE	TOTAL BY TAZ
28	5	86	9	95	102	11	113	109	11	120	117	12	129	28	34	34
29	1	142	0	142	162	0	162	171	0	171	182	0	182	29	40	
29	2	25	2	27	28	2	30	29	2	31	32	3	35	29	8	
29	3	10	3	13	11	3	14	12	4	16	13	4	17	29	4	
29	4	15	0	15	17	0	17	18	0	18	20	0	20	29	5	
29	6	17	3	20	20	3	23	21	4	25	23	4	27	29	7	64
30	1	78	5	83	85	5	90	91	5	96	96	7	103	30	20	
30	2	21	26	47	25	29	54	27	31	58	29	33	62	30	15	
30	3	99	47	146	109	52	161	117	55	172	125	59	184	30	38	
30	4	237	11	248	262	12	274	280	13	293	299	14	313	30	65	
30	5	240	60	300	270	67	337	291	73	364	314	78	392	30	92	230
31	1	56	2	58	61	2	63	66	2	68	70	2	72	31	14	
31	2	37	25	62	41	28	69	44	30	74	47	32	79	31	17	
31	3	46	72	118	51	80	131	54	85	139	58	91	149	31	31	
31	4	113	4	117	125	4	129	134	5	139	143	5	148	31	31	
31	5	153	16	169	175	18	193	188	20	208	203	21	224	31	55	148
34	4	2	0	2	2	0	2	2	0	2	3	0	3	34	1	
34	5	276	0	276	317	0	317	342	0	342	368	0	368	34	92	93
35	1	137	0	137	134	0	134	130	0	130	125	0	125	35	-12	
35	2	3	1	4	3	1	4	4	1	5	4	1	5	35	1	
35	3	5	0	5	6	0	6	6	0	6	7	0	7	35	2	
35	5	30	10	40	35	12	47	38	13	51	41	14	55	35	15	6
36	2	74	24	98	84	27	111	90	29	119	97	31	128	36	30	
36	3	26	16	42	29	18	47	31	19	50	33	20	53	36	11	
36	4	99	4	103	110	4	114	118	5	123	126	5	131	36	28	
36	5	319	30	349	362	34	396	390	37	427	420	40	460	36	111	180
37	1	4	2	6	4	2	6	5	2	7	5	2	7	37	1	
37	2	14	3	17	17	3	20	19	3	22	20	4	24	37	7	
37	3	4	0	4	5	0	5	5	0	5	5	0	5	37	1	
37	4	31	5	36	35	6	41	37	6	43	40	6	46	37	10	
37	5	31	10	41	36	12	48	38	12	50	41	13	54	37	13	32
38	1	104	7	111	116	8	124	124	8	132	133	9	142	38	31	
38	2	3	3	6	3	3	6	4	4	8	4	4	8	38	2	
38	4	3	1	4	3	1	4	4	1	5	4	1	5	38	1	
38	5	33	18	51	38	20	58	40	22	62	44	24	68	38	17	51
39	4	4	1	5	9	2	11	11	2	13	11	2	13	39	8	8
42	5	1	1	2	3	3	6	3	3	6	3	3	6	42	4	4
45	1	4	4	8	4	4	8	4	5	9	4	5	9	45	1	
45	2	32	12	44	39	14	53	41	15	56	44	16	60	45	16	
45	3	3	6	9	4	7	11	4	8	12	4	8	12	45	3	
45	4	3	2	5	4	2	6	4	3	7	4	3	7	45	2	
45	5	25	7	32	30	8	38	32	9	41	35	10	45	45	13	35
50	4	1	0	1	2	0	2	2	0	2	2	0	2	50	1	
50	5	56	23	79	66	28	94	71	31	102	76	33	109	50	30	31
55	1	414	2	416	443	2	445	468	2	470	495	2	497	55	81	
55	2	9	4	13	10	4	14	11	5	16	12	5	17	55	4	
55	3	17	5	22	19	6	25	20	6	26	21	6	27	55	5	
55	4	9	0	9	10	0	10	10	0	10	11	0	11	55	2	
55	5	17	4	21	19	5	24	21	5	26	22	5	27	55	6	98
56	1	25	1	26	28	1	29	29	1	30	31	1	32	56	6	
56	2	43	39	82	50	45	95	53	48	101	57	52	109	56	27	
56	3	18	17	35	21	20	41	22	21	43	24	22	46	56	11	
56	4	2	1	3	2	1	3	2	1	3	3	1	4	56	1	
56	5	18	5	23	21	6	27	23	6	29	24	7	31	56	8	53
58	4	2	0	2	2	0	2	2	0	2	3	0	3	58	1	
58	5	71	10	81	82	12	94	89	12	101	95	13	108	58	27	28
59	4	3	1	4	4	1	5	4	1	5	4	1	5	59	1	
59	5	29	9	38	35	11	46	37	12	49	40	12	52	59	14	15
60	1	3	1	4	5	2	7	5	2	7	5	2	7	60	3	3
61	5	1	4	5	2	7	9	2	7	9	2	8	10	61	5	5
64	1	141	0	141	157	0	157	167	0	167	179	0	179	64	38	
64	2	27	1	28	34	1	35	37	1	38	39	1	40	64	12	
64	5	2	2	4	2	2	4	2	2	4	3	3	6	64	2	52
65	3	3	2	5	4	3	7	4	3	7	5	3	8	65	3	
65	4	3	0	3	4	0	4	4	0	4	5	0	5	65	2	
65	5	60	3	63	71	4	75	76	4	80	82	4	86	65	23	28
67	2	136	0	136	172	0	172	184	0	184	197	0	197	67	61	
67	4	3	0	3	3	0	3	4	0	4	4	0	4	67	1	
67	5	2	2	4	2	2	4	2	2	4	3	3	6	67	2	64
69	2	176	139	315	197	155	352	211	166	377	225	178	403	69	88	
69	3	73	39	112	81	43	124	86	46	132	92	49	141	69	29	
69	4	18	5	23	20	6	26	21	6	27	23	6	29	69	6	
69	5	21	4	25	24	5	29	26	5	31	28	5	33	69	8	131
70	1	23	4	27	22	4	26	22	5	27	22	5	27	70	0	
70	2	89	28	117	100	31	131	107	34	141	114	36	150	70	33	
70	3	2	12	14	2	13	15	2	14	16	3	15	18	70	4	
70	4	22	6	28	24	7	31	26	7	33	28	8	36	70	8	
70	5	108	24	132	122	27	149	132	29	161	142	32	174	70	42	87
73	1	179	2	181	195	2	197	207	2	209	219	2	221	73	40	
73	2	12	2	14	15	2	17	15	2	17	17	3	20	73	6	
73	3	20	0	20	22	0	22	24	0	24	25	0	25	73	5	
73	4	7	1	8	8	1	9	8	1	9	9	1	10	73	2	
73	5	2	2	4	2	2	4	2	2	4	3	3	6	73	2	55
74	1	114	1	115	123	1	124	130	1	131	139	1	140	74	25	
74	2	37	1	38	46	3	51	51	3	54	55	3	58	74	20	
74	3	7	2	9	8	2	10	8	2	10	9	3	12	74	3	
74	5	148	1	149	167	1	168	180	1	181	194	1	195	74	46	94
75	1	27	0	27	31	0	31	33	0	33	35	0	35	75	8	
75	2	6	0	6	8	0	8	8	0	8	8	0	8	75	2	
75	4	8	0	8	9	0	9	10	0	10	11	0	11	75	3	
75	5	13	2	15	15	2	17	16	3	19	18	3	21	75	6	19
76	1	7	0	7	10	0	10	11	0	11	11	0	11	76	4	
76	5	1	1	2	1	1	2	2	2	4	2	2	4	76	2	6
78	1	26	1	27	29	1	30	31	1	32	33	1	34	78	7	
78	2	16	2	18	18	2	20	20	2	22	21	2	23	78	5	
78	3	27	18	45	30	20	50	32	22	54	34	23	57	78	12	
78	4	47	3	50	53	3	56	56	4	60	60	4	64	78	14	
78	5	29	3	32	33	3	36	36	4	40	38	4	42	78	10	48
79	1	34	1	35	38	1	39	40	1	41	43	1	44	79	9	
79	2	60	51	111	68	57	125	73	61	134	77	65	142	79	31	
79	3	35	53	88	39	59	98	41	63	104	44	67	111	79	23	
79	4	45	5	50	50	6	56	53	6	59	57	6	63	79	13	
79	5	55	18	73	62	20	82	67	22	89	72	24	96	79	23	99
80	2	9	10	19	10	11	21	11	12	23	12	13	25	80	6	
80	5	1143	173	1316	1289	196	1485	1390	211	1601	1499	228	1727	80	411	417
82	1	3	4	7	3	5	8	4	5	9	4	5	9	82	2	
82	2	3	1	4	4	1	5	4	1	5	4	1	5	82	1	
82	4	8	0	8	9	0	9	10	0	10	11	0	11	82	3	
82	5	25	4	29	30	5	35	32	5	37	34	5	39	82	10	16
83	2	23	17	40	26	19	45	28	20	48	30	22	52	83	12	
83	3	18	20	38	20	22	42	21	24	45	23	25	48	83	10	
83	4	9	1	10	10	1	11	11	1	12	11	1	12	83	2	
83	5	97	31	128	110	35	145	119	38	157	128	41	169	83	41	65
84	1	311	0	311	336	0	336	356	0	356	375	0	375	84	64	
84	5	139	12	151	158	14	172	171	15	186	184	16	200	84	49	113
85	1	48	2	50	51	2	53	54	2	56	58	2	60	85	10	
85	2	114	11	125	133	13	146	142	14	156	151	15	166	85	41	
85	3	53	42	95	59	46	105	63	50	113	67	53	120	85	25	
85	5	1235	203	1438	1389	228	1617	1497	246	1743	1615	265	1880	85	442	518

APPENDIX B - EMPLOYMENT ESTIMATES & PROJECTIONS BY TAZ 3/8

TAZ	BUSINESS GROUP	1991 FULL	PART	TOTAL	2000 FULL	PART	TOTAL	2010 FULL	PART	TOTAL	2020 FULL	PART	TOTAL	TAZ	1991-2020 NET CHANGE	TOTAL BY TAZ
86	2	2	3	5	3	4	7	3	5	8	3	5	8	86	3	
86	5	14	6	20	21	9	30	22	9	31	23	10	33	86	13	16
88	4	8	3	11	15	5	20	15	6	21	16	6	22	88	11	
91	1	1	0	1	1	0	1	1	0	1	2	0	2	91	1	
91	2	1	0	1	1	0	1	2	0	2	2	0	2	91	1	
91	4	3	1	4	4	1	5	4	1	5	5	2	7	91	3	
91	5	2	2	4	3	3	6	3	3	6	3	3	6	91	2	7
93	4	3	0	3	4	0	4	4	0	4	4	0	4	93	1	
93	5	27	2	28	33	2	35	35	3	38	38	3	41	93	12	13
95	2	4	0	4	9	0	9	9	0	9	9	0	9	95	5	5
96	4	2	0	2	4	0	4	4	0	4	4	0	4	96	2	
96	5	2	0	2	6	0	6	6	0	6	7	0	7	96	5	7
98	3	2	4	6	3	6	9	3	6	9	3	6	9	98	3	
98	5	64	16	80	76	19	95	81	20	101	88	22	110	98	30	33
100	2	10	0	10	12	0	12	13	0	13	14	0	14	100	4	
100	4	2	1	3	2	1	3	3	1	4	3	1	4	100	1	
100	5	10	5	15	12	6	18	13	7	20	14	7	21	100	6	11
101	3	6	0	6	8	0	8	8	0	8	9	0	9	101	3	
101	4	6	0	6	8	0	8	8	0	8	9	0	9	101	3	
101	5	1	1	2	1	1	2	1	1	2	2	2	4	101	2	8
102	1	3	1	4	3	1	4	3	1	4	3	1	4	102	0	
102	2	9	2	11	10	2	12	11	2	13	12	3	15	102	4	
102	3	3	0	3	3	0	3	4	0	4	4	0	4	102	1	
102	5	125	6	131	143	7	150	154	7	161	166	8	174	102	43	48
103	1	2	0	2	2	0	2	2	0	2	3	0	3	103	1	
103	2	28	6	34	31	7	38	34	7	41	36	8	44	103	10	
103	3	33	27	60	37	30	67	38	32	71	42	34	76	103	16	
103	4	11	3	14	12	3	15	13	4	17	14	4	18	103	4	
103	5	1020	83	1103	1148	94	1243	1238	101	1340	1336	109	1445	103	342	373
104	1	25	4	28	25	4	29	26	5	31	27	5	32	104	3	
104	2	62	9	71	69	10	78	74	11	85	80	12	92	104	21	
104	3	134	63	197	149	70	218	159	75	234	170	80	250	104	53	
104	4	10	1	11	11	1	12	12	1	13	13	1	14	104	3	
104	5	54	3	57	61	3	64	66	4	70	71	4	75	104	18	98
105	4	1	1	2	1	1	2	1	1	2	1	1	2	105	0	
105	5	8	19	27	10	23	33	11	25	36	11	27	38	105	11	11
106	2	28	4	32	32	5	37	34	5	39	36	5	41	106	9	
106	3	134	38	172	151	43	194	161	46	207	172	49	221	106	49	
106	4	18	2	20	20	2	22	22	2	24	23	3	26	106	6	
106	5	97	33	130	111	38	149	119	41	160	129	44	173	106	43	107
107	1	2	1	3	2	1	3	2	1	3	2	1	3	107	0	
107	2	1	2	3	1	2	3	1	2	3	1	3	4	107	1	
107	3	12	24	36	14	27	41	15	29	44	15	31	46	107	10	
107	4	10	5	15	11	6	17	12	6	18	13	6	19	107	4	
107	5	23	15	38	27	17	44	29	19	48	31	20	51	107	13	28
108	1	27	4	31	31	5	36	33	5	38	35	5	40	108	9	
108	4	35	0	35	40	0	40	43	0	43	46	0	46	108	11	20
110	1	2	1	3	2	1	3	2	1	3	3	1	4	110	1	
110	2	80	34	114	91	39	130	97	41	138	104	44	148	110	34	
110	3	6	4	10	7	4	11	7	5	12	8	5	13	110	3	
110	5	13	3	16	15	3	18	16	4	20	17	4	21	110	5	43
111	1	22	5	27	26	6	32	27	6	33	29	7	36	111	9	
111	3	20	4	24	23	5	28	25	5	30	26	5	31	111	7	
111	4	6	0	6	7	0	7	7	0	7	8	0	8	111	2	18
112	5	1	1	2	3	3	6	3	3	6	3	3	6	112	4	4
113	1	36	4	40	42	5	47	45	5	50	47	5	52	113	12	
113	2	39	1	40	48	1	49	51	1	52	55	2	57	113	17	
113	3	4	0	4	5	0	5	5	0	5	5	0	5	113	1	
113	5	34	2	36	40	2	42	43	3	46	47	3	50	113	14	44
114	1	3	2	5	3	2	5	3	2	5	4	2	6	114	1	
114	2	785	796	1581	875	887	1762	937	950	1887	1003	1017	2020	114	439	
114	3	131	154	285	145	170	315	155	182	337	165	194	359	114	74	
114	4	50	3	53	55	3	58	59	4	63	63	4	67	114	14	
114	5	220	40	260	247	45	292	267	48	315	287	52	339	114	79	607
115	1	49	5	54	61	6	67	65	6	71	69	7	76	115	22	
115	2	3	0	3	4	0	4	4	0	4	4	0	4	115	1	
115	3	1	0	1	1	0	1	1	0	1	1	0	1	115	0	23
116	1	232	7	239	249	8	257	263	8	271	279	9	288	116	49	
116	2	292	226	518	328	253	581	350	271	621	375	290	665	116	147	
116	3	116	135	251	128	149	277	137	160	297	147	171	318	116	67	
116	4	270	3	273	300	3	303	321	4	325	343	4	347	116	74	
116	5	78	7	85	95	8	103	101	9	110	109	10	119	116	34	371
119	2	13	3	16	14	3	17	15	4	19	17	4	21	119	5	
119	3	33	9	42	36	10	46	39	11	50	42	12	54	119	12	
119	4	14	8	22	15	9	24	16	9	25	18	10	28	119	6	
119	5	241	45	286	270	50	320	291	54	345	320	60	380	119	94	117
121	1	47	8	55	53	9	62	56	10	66	59	10	69	121	14	
121	2	40	4	44	51	5	56	54	5	59	58	6	64	121	20	
121	5	4	1	5	5	1	6	5	1	6	5	1	6	121	1	35
122	1	240	22	262	259	24	283	273	25	298	287	26	313	122	51	
122	2	13	0	13	15	0	15	16	0	16	17	0	17	122	4	
122	5	10	0	10	11	0	11	12	0	12	13	0	13	122	3	58
123	4	5	1	6	10	2	12	10	2	12	11	2	13	123	7	
123	5	3	1	4	6	2	8	6	2	8	7	2	9	123	5	12
124	1	50	17	67	56	19	75	60	21	81	64	22	86	124	19	
124	2	43	1	44	55	1	56	58	1	59	62	1	63	124	19	
124	3	1	0	1	1	0	1	1	0	1	1	0	1	124	0	
124	4	2	0	2	2	0	2	2	0	2	3	0	3	124	1	
124	5	3	4	7	3	5	8	4	5	9	4	5	9	124	2	41
125	1	70	5	75	76	5	81	81	5	86	85	6	91	125	16	
125	2	148	29	177	166	32	198	178	34	212	190	37	227	125	50	
125	3	154	36	190	170	40	210	182	42	224	184	45	239	125	49	
125	4	55	16	71	61	18	79	65	19	84	69	20	89	125	18	
125	5	238	40	278	267	45	312	288	48	336	311	52	363	125	85	218
126	1	281	12	293	301	13	314	319	14	333	335	15	350	126	57	
126	2	151	6	157	182	7	189	194	7	201	209	7	216	126	59	
126	3	68	1	69	75	1	76	80	1	81	86	1	87	126	18	
126	4	34	13	47	38	14	52	40	15	55	43	16	59	126	12	
126	5	149	9	158	167	10	177	181	11	192	196	12	207	126	49	195
127	1	128	12	140	140	13	153	148	14	162	156	14	170	127	30	
127	2	7	3	10	9	4	13	9	4	13	10	4	14	127	4	
127	4	2	1	3	2	1	3	2	1	3	3	1	4	127	1	
127	5	40	1	41	45	1	46	49	1	50	53	1	54	127	13	48
128	1	153	1	154	165	1	166	174	1	175	184	1	185	128	31	
128	2	29	0	29	36	0	36	39	0	39	41	0	41	128	12	
128	3	2	0	2	2	0	2	2	0	2	3	0	3	128	1	
128	4	5	0	5	6	0	6	6	0	6	6	0	6	128	1	
128	5	24	4	28	27	5	32	29	5	34	32	5	37	128	9	23
129	2	22	4	26	27	5	32	28	5	33	30	5	35	129	9	
129	3	8	5	13	9	6	15	10	6	16	11	7	18	129	5	
129	4	2	0	2	2	0	2	2	0	2	3	0	3	129	1	
129	5	12	3	15	14	4	18	15	4	19	16	4	20	129	5	20
130	4	30	5	35	53	9	62	56	9	65	58	10	68	130	33	33
131	5	20	0	20	47	0	47	48	0	48	50	0	50	131	30	30
133	1	33	1	34	42	1	43	44	1	45	46	1	47	133	13	
133	2	3	0	3	4	0	4	4	0	4	4	0	4	133	1	
133	4	5	0	5	6	0	6	7	0	7	7	0	7	133	2	
133	5	2	1	3	3	1	4	3	1	4	3	2	5	133	2	18

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TAZ	BUSINESS GROUP	1991 FULL	1991 PART	1991 TOTAL	2000 FULL	2000 PART	2000 TOTAL	2010 FULL	2010 PART	2010 TOTAL	2020 FULL	2020 PART	2020 TOTAL	TAZ	1991-2020 NET CHANGE	TOTAL BY TAZ
135	1	1	0	1	1	0	1	1	0	1	1	0	1	135	0	
135	2	4	0	4	5	0	5	5	0	5	5	0	5	135	1	
135	3	47	62	109	54	71	125	57	75	132	61	80	141	135	32	
135	4	26	1	27	30	1	31	32	1	33	33	1	34	135	7	
135	5	74	16	90	86	19	105	92	20	112	99	21	120	135	30	70
136	1	67	1	68	75	1	76	80	1	81	85	1	86	136	18	
136	2	7	0	7	8	0	8	8	0	8	9	0	9	136	2	
136	3	5	0	5	6	0	6	6	0	6	6	0	6	136	1	
136	5	336	52	388	382	59	441	412	64	476	444	69	513	136	125	146
137	1	794	27	821	854	29	883	904	31	935	957	33	990	137	169	169
138	5	67	0	67	85	0	85	91	0	91	97	0	97	138	30	30
140	2	5	0	5	8	0	8	8	0	8	9	0	9	140	4	
140	3	2	1	3	3	2	5	3	2	5	3	2	5	140	2	
140	4	3	3	6	5	5	10	5	5	10	5	5	10	140	4	
140	5	3	1	4	5	2	7	5	2	7	5	2	7	140	3	13
141	2	7	25	32	9	32	41	10	34	44	10	37	47	141	16	
141	4	10	3	13	13	4	17	14	4	18	14	4	18	141	5	
141	5	8	2	10	12	3	15	13	3	16	13	3	16	141	6	26
143	1	7	0	7	8	0	8	9	0	9	9	0	9	143	2	
143	2	17	10	27	20	12	32	21	13	34	23	13	36	143	9	
143	3	10	2	12	12	2	14	12	2	14	13	3	16	143	4	
143	4	25	12	37	29	14	43	31	15	46	33	16	49	143	12	
143	5	188	22	210	225	26	251	241	28	269	259	30	289	143	79	106
144	2	1	1	2	1	1	2	1	1	2	2	2	4	144	2	
144	5	6	4	10	8	6	14	9	6	15	9	6	15	144	5	7
145	1	10	0	10	11	0	11	12	0	12	13	0	13	145	3	
145	2	83	0	83	107	0	107	115	0	115	122	0	122	145	39	
145	5	15	0	15	18	0	18	19	0	19	21	0	21	145	6	48
146	1	87	22	109	97	24	121	104	26	130	110	28	138	146	29	29
147	2	186	102	288	207	114	321	222	122	344	238	130	368	147	80	
147	3	398	173	571	439	191	630	469	204	673	501	218	719	147	148	
147	4	42	4	46	46	4	50	50	4	54	53	6	59	147	13	
147	5	74	37	111	83	42	125	90	45	135	97	48	145	147	34	275
148	1	37	25	62	36	24	60	34	23	57	33	22	55	148	-7	-7
149	2	19	3	22	23	4	27	24	4	28	26	4	30	149	8	
149	3	7	0	7	8	0	8	9	0	9	9	0	9	149	2	
149	4	3	6	9	4	7	11	4	8	12	4	8	12	149	3	
149	5	45	2	47	55	2	57	59	3	62	63	3	66	149	19	32
150	3	20	25	45	22	28	50	24	30	54	26	32	58	150	13	
150	5	108	5	113	123	6	129	133	6	139	143	7	150	150	37	50
152	1	8	0	8	9	0	9	10	0	10	10	0	10	152	2	
152	4	37	5	42	42	6	48	45	6	51	48	6	54	152	12	
152	5	56	7	63	64	8	72	69	9	78	75	9	84	152	21	35
153	1	26	1	27	29	1	30	30	1	31	33	1	34	153	7	
153	2	118	37	155	133	42	175	143	45	188	153	48	201	153	46	
153	3	10	16	26	11	18	29	12	19	31	13	20	33	153	7	
153	4	23	3	26	26	3	29	28	3	31	29	4	33	153	7	
153	5	117	29	146	134	33	167	144	36	180	155	38	193	153	47	114
154	1	861	21	882	936	23	959	993	24	1017	1054	25	1079	154	197	
154	2	28	6	34	34	8	42	37	8	45	39	9	48	154	14	
154	3	5	0	5	6	0	6	6	0	6	6	0	6	154	1	
154	4	12	0	12	13	0	13	14	0	14	15	0	15	154	3	
154	5	26	3	29	29	3	32	32	4	36	34	4	38	154	9	224
155	1	3	0	3	5	0	5	5	0	5	5	0	5	155	2	
155	3	3	1	4	5	2	7	5	2	7	5	2	7	155	3	5
157	5	3	0	3	14	0	14	14	0	14	14	0	14	157	11	11
159	2	3	1	4	3	1	4	4	1	5	4	1	5	159	1	
159	3	4	13	17	5	15	20	5	16	21	5	17	22	159	5	
159	4	49	2	51	57	2	59	60	2	62	64	3	67	159	16	
159	5	79	27	106	92	32	124	99	34	133	107	36	143	159	37	59
160	1	114	9	123	129	10	139	137	11	148	156	12	168	160	45	
160	2	19	3	22	23	3	26	25	3	28	29	5	34	160	12	
160	3	4	12	16	5	14	19	5	15	20	6	17	23	160	7	
160	4	1	0	1	1	0	1	1	0	1	1	0	1	160	0	.
160	5	111	56	167	131	64	195	141	70	211	155	75	230	160	63	127
165	1	37	0	37	42	0	42	43	0	43	45	0	45	165	8	
165	2	77	8	85	95	10	105	102	10	112	108	11	119	165	34	
165	4	16	2	18	18	2	20	20	2	22	21	3	24	165	6	
165	5	21	3	24	25	4	29	26	4	30	28	4	32	165	8	56
166	2	2	0	2	3	0	3	3	0	3	3	0	3	166	1	
166	3	21	0	21	27	0	27	29	0	29	30	0	30	166	9	
166	5	20	1	21	26	1	27	28	1	29	30	1	31	166	10	20
170	1	11	0	11	13	0	13	13	0	13	14	0	14	170	3	
170	2	6	0	6	7	0	7	7	0	7	8	0	8	170	2	
170	4	9	3	12	10	3	13	11	4	15	12	4	16	170	4	
170	5	52	3	55	60	3	63	65	4	69	70	4	74	170	19	28
171	2	68	58	126	81	66	147	86	71	157	92	76	168	171	42	
171	3	9	7	16	10	8	18	11	8	19	12	9	21	171	5	
171	4	63	2	65	72	2	74	76	2	78	81	3	84	171	19	
171	5	20	7	27	23	8	31	25	9	34	27	9	36	171	8	75
172	3	0	4	4	0	7	7	0	7	7	0	8	8	172	4	
172	5	0	1	1	0	2	2	0	2	2	0	2	2	172	1	5
176	1	10	3	13	11	3	14	12	4	16	13	4	17	176	4	
176	2	176	113	289	199	128	327	213	137	350	228	146	374	176	85	
176	3	3	13	16	3	15	18	4	16	20	4	17	21	176	5	
176	5	70	54	124	80	61	141	86	66	152	93	71	164	176	40	134
177	1	898	1	899	964	1	965	1020	1	1021	1078	1	1079	177	180	
177	2	200	153	353	229	171	400	245	183	428	262	196	458	177	105	
177	3	105	103	208	116	114	230	124	122	246	133	130	263	177	55	
177	4	30	1	31	33	1	34	35	1	36	38	1	39	177	8	
177	5	156	46	202	175	52	227	189	56	245	204	60	264	177	62	410
178	1	306	0	306	329	0	329	348	0	348	367	0	367	178	62	
178	2	18	1	19	23	1	24	24	1	25	25	1	26	178	7	
178	3	12	25	37	13	28	41	14	30	44	15	32	47	178	10	
178	4	52	25	77	58	28	86	62	30	92	66	32	98	178	21	
178	5	48	8	56	55	9	64	59	10	69	63	11	74	178	18	118
179	3	4	2	6	9	3	12	9	3	12	10	3	13	179	7	7
180	5	1	1	2	2	2	4	2	2	4	2	2	4	180	2	2
181	1	5	0	5	7	0	7	7	0	7	7	0	7	181	2	
181	5	7	2	9	12	3	15	13	3	16	13	3	16	181	7	9
183	1	3	0	3	3	0	3	3	0	3	3	0	3	183	0	
183	2	2	0	2	2	0	2	2	0	2	3	0	3	183	1	
183	4	21	4	25	23	4	27	25	5	30	27	5	32	183	7	
183	5	292	6	298	338	7	345	363	7	370	391	8	399	183	101	108
185	2	2	0	2	3	0	3	3	0	3	3	0	3	185	1	
185	4	1	0	1	2	0	2	2	0	2	2	0	2	185	1	
185	5	3	1	4	5	2	7	5	2	7	5	2	7	185	3	5
186	1	2	0	2	4	0	4	4	0	4	4	0	4	186	2	
186	2	3	0	3	6	0	6	6	0	6	6	0	6	186	3	
186	3	3	1	4	6	2	8	6	2	8	6	2	8	186	4	
186	5	2	0	2	41	0	41	41	0	41	41	0	41	186	39	48
188	1	425	0	425	456	0	456	480	0	480	507	0	507	188	82	
188	4	2	2	4	2	2	4	2	2	4	3	3	6	188	2	
188	5	22	13	35	25	15	40	27	16	43	29	17	46	188	11	95
189	1	216	7	223	240	7	247	253	8	261	267	9	276	189	53	
189	2	11	0	11	14	0	14	14	0	14	16	0	16	189	5	
189	5	0	3	3	0	3	3	0	4	4	0	4	4	189	1	59
190	1	923	45	968	990	48	1038	1045	51	1096	1104	54	1158	190	190	
190	4	48	3	51	53	3	56	57	4	61	61	4	65	190	14	
190	5	15	5	20	17	6	23	18	6	24	20	7	27	190	7	211

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TAZ	BUSINESS GROUP	1991 FULL	PART	TOTAL	2000 FULL	PART	TOTAL	2010 FULL	PART	TOTAL	2020 FULL	PART	TOTAL	TAZ	1991-2020 NET CHANGE	TOTAL BY TAZ
181	1	18	1	19	26	1	27	27	2	29	28	2	30	191	11	
181	5	0	3	3	0	5	5	0	5	5	0	5	5	191	2	13
193	1	45	3	48	48	3	51	50	3	53	52	3	55	193	7	
193	2	203	172	375	226	192	418	242	205	447	259	220	479	193	104	
193	3	127	37	164	140	41	181	150	44	194	160	47	207	193	43	
193	4	38	16	54	42	18	60	45	19	64	48	20	68	193	14	
193	5	86	12	88	87	13	110	104	15	119	112	16	128	193	30	198
194	1	17	1	18	19	1	20	21	1	22	22	1	23	194	5	
194	3	73	25	98	84	29	113	89	31	120	85	33	128	194	30	
194	4	52	7	59	60	8	68	63	8	72	67	9	76	194	17	
194	5	8	6	14	9	7	16	10	8	18	11	8	19	194	5	57
195	1	6	0	6	6	0	6	7	0	7	8	0	8	195	2	
195	2	89	25	114	100	28	128	107	30	137	115	32	147	195	33	
195	3	11	6	17	12	7	19	13	7	20	14	8	22	195	5	
195	4	24	10	34	26	11	37	28	12	40	31	13	44	195	10	
195	5	274	188	462	310	213	523	335	230	565	361	247	608	195	146	195
196	2	6	0	6	7	0	7	7	0	7	8	0	8	196	2	
196	3	120	163	283	133	181	314	142	193	335	152	206	358	196	75	
196	4	10	0	10	11	0	11	12	0	12	13	0	13	196	3	
196	5	28	8	36	32	9	41	34	10	44	37	11	48	196	12	92
197	1	35	10	45	40	11	51	43	12	55	46	13	59	197	14	
197	2	15	3	18	19	4	23	20	4	24	22	4	26	197	8	
197	5	10	0	10	12	0	12	13	0	13	13	0	13	197	3	25
198	1	22	3	25	28	4	32	28	4	33	31	4	35	198	10	
198	3	3	1	4	4	1	5	4	1	5	4	1	5	198	1	
198	5	17	2	19	22	3	25	24	3	27	25	3	28	198	9	20
199	1	28	1	29	31	1	32	33	1	34	34	1	35	199	6	
199	2	66	52	118	74	58	132	79	63	142	85	67	152	199	34	
199	3	11	2	13	12	2	14	13	2	15	14	3	17	199	4	
199	4	11	3	14	12	3	15	13	4	17	14	4	18	199	4	
199	5	57	22	79	65	25	80	70	27	97	75	29	104	199	25	73
200	1	52	1	53	56	1	57	60	1	61	63	1	64	200	11	
200	2	20	10	30	23	11	34	24	12	36	26	13	39	200	9	
200	3	10	4	14	11	4	15	12	5	17	13	5	18	200	4	
200	4	5	0	5	6	0	6	6	0	6	6	0	6	200	1	
200	5	37	10	47	42	11	53	46	12	58	49	13	62	200	15	40
201	1	28	2	30	31	2	33	33	2	35	34	2	36	201	6	
201	2	146	25	171	171	29	200	183	31	214	197	33	230	201	59	
201	3	9	2	11	10	2	12	11	2	13	11	3	14	201	3	
201	4	12	0	12	13	0	13	14	0	14	15	0	15	201	3	
201	5	108	7	115	122	8	130	131	9	140	142	8	151	201	36	107
202	1	77	1	78	84	1	85	89	1	90	94	1	95	202	17	
202	2	23	0	23	27	0	27	28	0	28	31	0	31	202	8	
202	5	25	8	34	28	10	39	31	11	42	33	12	45	202	11	36
203	4	16	0	16	19	0	19	20	0	20	21	0	21	203	5	
203	5	18	8	27	24	10	34	27	11	38	28	12	41	203	14	19
205	1	3	0	3	4	0	4	4	0	4	4	0	4	205	1	
205	5	42	0	42	50	0	50	54	0	54	58	0	58	205	16	17
206	1	16	2	18	18	2	20	19	2	21	20	3	23	206	5	
206	2	10	1	11	12	1	13	12	1	13	13	1	14	206	3	
206	3	7	3	10	8	3	11	9	4	13	9	4	13	206	3	
206	5	17	6	23	20	7	27	21	8	29	23	8	31	206	8	19
207	2	24	2	26	31	3	34	33	3	36	36	3	39	207	13	
207	5	0	1	1	0	1	1	0	1	1	0	1	1	207	0	13
208	4	0	1	1	0	1	1	0	1	1	0	1	1	208	0	
208	5	0	12	12	0	16	16	0	18	18	0	19	19	208	7	7
209	1	11	0	11	12	0	12	13	0	13	14	0	14	209	3	
209	4	9	0	9	10	0	10	11	0	11	12	0	12	209	3	
209	5	115	5	120	131	6	137	142	6	148	152	7	159	209	39	45
210	1	202	20	222	237	24	261	252	25	277	268	27	295	210	73	
210	2	2	1	3	2	1	3	3	1	4	3	1	4	210	1	
210	3	6	3	8	7	4	11	8	4	12	8	4	12	210	3	
210	5	36	6	42	43	7	50	46	8	54	50	8	58	210	16	93
211	1	700	50	750	747	53	800	788	56	845	833	59	892	211	142	
211	2	67	11	78	80	12	82	86	13	99	92	14	106	211	28	
211	3	7	21	28	8	23	31	8	25	33	8	26	35	211	7	
211	4	15	5	20	17	6	23	18	6	24	19	6	25	211	5	
211	5	67	15	82	75	17	92	81	18	99	88	20	108	211	26	208
212	1	100	0	100	110	0	110	116	0	116	122	0	122	212	22	22
213	2	11	1	12	17	2	18	17	2	18	18	2	20	213	8	
213	3	57	1	58	76	1	77	80	1	81	85	1	86	213	28	
213	4	24	0	24	32	0	32	34	0	34	36	0	36	213	12	48
214	1	97	3	100	114	4	118	120	4	124	125	4	129	214	29	29
215	2	218	196	414	250	224	474	267	240	507	286	256	542	215	128	
215	3	14	37	51	16	42	58	17	45	62	18	48	66	215	15	
215	4	20	5	25	23	6	29	24	6	30	26	6	32	215	7	
215	5	72	8	80	83	8	92	89	10	99	96	11	107	215	27	177
217	1	4	0	4	8	0	8	8	0	8	8	0	8	217	4	4
218	5	0	1	1	0	10	10	0	10	10	0	10	10	218	9	9
219	1	225	0	225	254	0	254	271	0	271	288	0	289	218	64	
219	2	16	33	49	18	38	56	19	40	59	21	43	64	219	15	
219	3	18	1	19	20	1	21	22	1	23	23	1	24	219	5	
219	4	10	5	15	11	6	17	12	6	18	13	6	18	219	4	
219	5	3	0	3	3	0	3	4	0	4	4	0	4	219	1	89
220	1	6	2	8	7	2	9	7	2	9	8	3	11	220	3	
220	2	64	2	66	82	2	84	88	3	91	94	3	97	220	31	
220	3	6	9	15	7	11	18	8	11	19	8	12	20	220	5	
220	5	0	1	1	0	1	1	0	1	1	0	1	1	220	0	39
221	1	178	0	178	195	0	195	205	0	205	217	0	217	221	39	
221	2	57	0	57	72	0	72	77	0	77	82	0	82	221	25	
221	3	8	6	14	9	7	16	10	7	17	10	8	18	221	4	
221	4	21	5	26	24	6	30	25	6	31	27	6	33	221	7	
221	5	3	0	3	3	0	3	4	0	4	4	0	4	221	1	76
224	1	8	0	8	8	0	9	10	0	10	11	0	11	224	3	
224	2	46	38	84	56	45	101	59	48	107	63	52	115	224	31	
224	3	2	0	2	2	0	2	3	0	3	3	0	3	224	1	
224	4	6	4	10	7	5	12	8	5	13	8	5	13	224	3	
224	5	2	4	6	2	5	7	3	5	8	3	6	9	224	3	41
225	1	6	2	8	7	2	9	7	2	9	8	3	11	225	3	
225	2	37	36	73	43	42	85	46	45	91	49	48	97	225	24	
225	3	61	24	85	70	28	98	75	29	104	79	31	110	225	25	
225	4	3	0	3	3	0	3	4	0	4	4	0	4	225	1	
225	5	10	4	14	12	5	17	13	5	18	13	5	18	225	4	57
226	1	17	2	19	18	2	20	19	2	21	20	2	22	226	3	
226	2	41	45	86	47	52	99	50	55	105	54	59	113	226	27	
226	3	45	7	52	51	8	59	55	8	63	58	9	67	226	15	
226	4	3	0	3	3	0	3	4	0	4	4	0	4	226	1	
226	5	55	11	66	64	13	77	69	14	83	74	15	89	226	23	69
227	1	280	16	296	306	17	323	324	18	343	344	20	364	227	68	
227	2	79	10	88	96	11	107	102	12	114	110	13	123	227	34	
227	3	17	0	17	19	0	19	20	0	20	22	0	22	227	5	
227	4	52	4	56	59	4	63	62	5	67	66	5	71	227	15	
227	5	22	15	37	25	17	42	27	18	45	29	20	49	227	12	134
228	1	4	0	4	4	0	4	5	0	5	5	0	5	228	1	
228	2	88	38	126	99	43	142	105	45	150	113	49	162	228	36	
228	3	35	15	50	39	17	56	41	18	59	44	19	63	228	13	
228	4	0	1	1	0	1	1	0	1	1	0	1	1	228	0	
228	5	40	9	49	45	10	55	48	11	59	53	12	65	228	16	66

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TAZ	BUSINESS GROUP	1991 FULL	1991 PART	1991 TOTAL	2000 FULL	2000 PART	2000 TOTAL	2010 FULL	2010 PART	2010 TOTAL	2020 FULL	2020 PART	2020 TOTAL	TAZ	1991-2020 NET CHANGE	TOTAL BY TAZ
229	2	10	2	12	12	2	14	12	2	14	13	3	16	229	4	
229	3	13	10	23	15	12	27	16	12	28	17	13	30	229	7	
229	4	11	3	14	13	3	16	13	4	17	14	4	18	229	4	
229	5	14	1	15	16	1	17	18	1	19	19	1	20	229	5	20
230	1	1	0	1	1	0	1	1	0	1	1	0	1	230	0	
230	2	10	19	29	13	24	37	14	25	39	14	27	41	230	12	
230	4	80	0	80	94	0	94	100	0	100	107	0	107	230	27	39
231	1	118	3	121	130	3	133	140	4	144	148	4	152	231	31	
231	2	78	22	100	88	25	113	94	27	121	101	29	130	231	30	
231	3	62	33	95	69	37	106	73	39	112	78	42	120	231	25	
231	4	115	2	117	128	2	130	136	2	138	146	2	148	231	31	
231	5	103	20	123	116	23	139	125	24	149	135	26	161	231	38	156
233	1	2	0	2	2	0	2	4	0	4	4	0	4	233	2	
233	5	1	1	2	1	1	2	2	2	4	2	2	4	233	2	4
234	2	43	0	43	55	0	55	60	0	60	63	0	63	234	20	
234	3	4	1	5	5	1	6	5	1	6	5	1	6	234	1	
234	5	10	3	13	12	4	16	13	4	17	14	4	18	234	5	26
235	1	335	4	339	370	4	374	395	4	399	422	5	427	235	88	
235	2	97	6	103	121	7	128	129	7	136	139	9	148	235	45	
235	3	1	0	1	1	0	1	1	0	1	1	0	1	235	0	
235	4	5	1	6	5	1	6	6	1	7	7	1	8	235	2	
235	5	14	6	20	18	9	27	19	9	28	20	10	30	235	10	145
237	1	3	0	3	5	0	5	5	0	5	6	0	6	237	3	
237	4	1	0	1	2	0	2	2	0	2	2	0	2	237	1	
237	5	1	2	3	2	6	8	2	6	8	2	6	8	237	5	9
239	1	263	1	264	284	1	285	301	1	302	319	1	320	239	56	
239	2	129	4	133	161	5	166	172	5	177	185	6	191	239	58	
239	3	7	0	7	8	0	8	8	0	8	9	0	9	239	2	
239	5	37	0	37	42	0	42	45	0	45	48	0	48	239	11	127
240	1	18	3	21	20	3	23	21	3	24	23	4	27	240	6	
240	2	28	17	45	31	19	50	34	20	54	36	22	58	240	13	
240	3	84	42	126	93	47	140	100	50	150	106	53	159	240	33	
240	4	33	2	35	37	2	39	39	2	41	42	3	45	240	10	
240	5	119	21	140	134	24	158	145	26	171	156	28	184	240	44	106
241	1	13	1	14	15	1	16	15	1	16	17	1	18	241	4	
241	2	11	2	13	13	2	15	13	2	15	14	3	17	241	4	
241	3	2	0	2	2	0	2	2	0	2	3	0	3	241	1	
241	4	24	0	24	27	0	27	29	0	29	31	0	31	241	7	
241	5	181	15	196	209	17	226	225	19	244	242	20	262	241	66	82
242	2	13	0	13	19	0	19	20	0	20	21	0	21	242	8	
242	5	7	7	14	10	9	19	11	10	21	11	11	22	242	8	16
244	1	15	0	15	20	0	20	21	0	21	22	0	22	244	7	
244	5	1	0	1	1	0	1	1	0	1	2	0	2	244	1	8
245	2	6	0	6	26	0	26	27	0	27	28	0	28	245	22	
245	5	1	0	1	4	0	4	4	0	4	4	0	4	245	3	25
246	1	4	1	5	4	1	5	5	1	6	5	1	6	246	1	
246	2	80	93	173	90	104	194	96	112	208	103	120	223	246	50	
246	3	316	110	426	351	122	473	375	131	506	401	140	541	246	115	
246	4	24	2	26	27	2	29	28	2	30	30	3	33	246	7	
246	5	133	16	149	150	18	168	162	20	182	175	21	196	246	47	219
247	2	7	0	7	11	0	11	12	0	12	12	0	12	247	5	
247	5	2	1	3	3	1	4	3	2	5	3	2	6	247	2	7
248	1	60	11	71	65	12	77	68	12	80	72	13	85	248	14	
248	2	37	3	40	42	3	45	45	4	49	48	4	52	248	12	
248	3	29	4	33	32	4	36	35	5	40	37	5	42	248	9	
248	4	1	0	1	1	0	1	1	0	1	1	0	1	248	0	
248	5	21	4	25	24	5	29	26	5	31	28	5	33	248	8	43
249	3	7	2	9	8	2	10	9	2	11	9	3	12	249	3	
249	4	12	1	13	14	1	15	15	1	16	16	1	17	249	4	
249	5	21	4	25	25	5	30	27	5	32	29	5	34	249	9	16
250	2	30	20	50	34	23	57	36	24	60	39	26	65	250	15	
250	3	4	1	5	4	1	5	5	1	6	5	1	6	250	1	
250	5	81	1	82	93	1	94	100	1	101	107	1	108	250	26	42
251	4	2	1	3	3	2	5	3	2	5	3	2	5	251	2	
251	5	3	1	4	5	2	7	5	2	7	5	2	7	251	3	5
252	2	25	91	116	29	104	133	31	111	142	33	119	152	252	36	
252	3	80	33	113	91	37	128	97	40	137	103	43	146	252	33	
252	4	23	0	23	26	0	26	28	0	28	30	0	30	252	7	
252	5	11	5	16	13	6	19	14	6	20	15	7	22	252	6	82
253	1	5	2	7	5	2	7	6	2	8	6	2	8	253	1	
253	2	6	1	7	7	1	8	8	1	9	8	1	9	253	2	
253	3	16	76	92	18	86	104	19	92	111	21	98	119	253	27	
253	5	2	1	3	2	1	3	2	1	3	3	1	4	253	1	31
254	1	92	55	147	104	62	166	111	66	177	118	71	189	254	42	
254	2	49	30	79	56	34	90	60	37	97	64	39	103	254	24	
254	3	2	0	2	2	0	2	2	0	2	3	0	3	254	1	
254	5	93	4	97	109	6	115	117	7	124	125	7	132	254	35	102
256	1	1289	2	1291	1374	2	1376	1451	2	1453	1532	3	1535	256	244	
256	4	15	0	15	17	0	17	18	0	18	19	0	19	256	4	
256	5	2	1	3	2	1	3	2	1	3	3	1	4	256	1	249
258	1	222	20	242	239	22	261	252	23	275	266	24	290	258	48	
258	2	5	5	10	6	6	12	7	7	14	7	7	14	258	4	
258	5	1	1	2	1	1	2	1	1	2	1	1	2	258	0	52
259	1	48	4	52	53	4	57	56	5	61	59	5	64	259	12	
259	2	117	0	117	152	0	152	162	0	162	173	0	173	259	56	
259	5	0	1	1	0	1	1	0	1	1	0	1	1	259	0	68
260	1	6	3	9	6	3	9	7	3	10	7	3	10	260	1	
260	2	20	2	22	22	2	24	24	2	26	26	3	29	260	7	
260	3	160	1	161	177	1	178	190	1	191	202	1	203	260	42	
260	4	102	12	114	113	14	127	121	14	135	130	15	145	260	31	
260	5	48	29	77	54	33	87	58	35	93	63	38	101	260	14	106
261	1	52	0	52	53	0	53	53	0	53	52	0	52	261	0	
261	2	3	1	4	3	1	4	4	1	5	4	1	5	261	1	
261	5	4	6	10	5	7	12	5	8	13	5	8	13	261	1	1
262	1	11	3	14	12	3	15	13	3	16	12	4	16	262	2	
262	2	36	0	36	44	0	44	47	0	47	51	0	51	262	15	
262	3	2	0	2	2	0	2	2	0	2	3	0	3	262	1	
262	4	4	0	4	5	0	5	5	0	5	5	0	5	262	1	
262	5	7	2	9	8	2	10	9	3	12	9	3	12	262	3	22
263	2	13	0	13	22	0	22	23	0	23	24	0	24	263	11	
263	4	3	0	3	5	0	5	5	0	5	5	0	5	263	2	13
264	1	119	43	162	134	48	182	142	50	192	151	53	204	264	42	
264	2	13	0	13	17	0	17	18	0	18	19	0	19	264	6	
264	3	2	1	3	2	1	3	2	1	3	3	1	4	264	1	49
265	1	178	12	190	194	13	207	206	14	220	218	15	233	265	43	
265	2	50	13	63	61	16	77	66	17	83	70	18	88	265	25	
265	3	4	3	7	4	3	7	5	4	9	5	4	9	265	2	
265	5	71	12	83	81	14	95	88	15	103	94	16	110	265	27	97
266	1	147	7	154	163	8	171	174	8	182	186	9	194	266	40	
266	2	15	0	15	18	0	18	19	0	19	20	0	20	266	5	
266	3	14	3	17	16	3	19	17	4	21	18	4	22	266	8	
266	4	32	0	32	36	0	36	38	0	38	41	0	41	266	9	
266	5	71	15	86	80	17	97	87	18	105	93	20	113	266	27	86
267	1	32	2	34	36	2	38	39	2	41	41	2	43	267	9	
267	2	19	8	27	22	10	32	23	11	34	25	12	37	267	10	
267	3	4	1	5	4	1	5	5	1	6	5	1	6	267	1	
267	4	7	0	7	8	0	8	8	0	8	9	0	9	267	2	
267	5	78	6	84	89	7	96	96	7	103	103	8	111	267	27	49

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TAZ	BUSINESS GROUP	1991 FULL	1991 PART	1991 TOTAL	2000 FULL	2000 PART	2000 TOTAL	2010 FULL	2010 PART	2010 TOTAL	2020 FULL	2020 PART	2020 TOTAL	TAZ	1991-2020 NET CHANGE	TOTAL BY TAZ
268	1	118	3	121	126	3	129	132	3	135	136	4	140	268	19	
268	2	54	17	71	62	18	81	66	20	86	71	22	93	268	22	
268	3	10	8	18	11	9	20	12	10	22	13	10	23	268	5	
268	5	33	7	40	37	8	45	40	9	48	43	9	52	268	12	58
269	1	3	0	3	4	0	4	4	0	4	4	0	4	269	1	
269	2	2	1	3	3	1	4	3	1	4	3	1	4	269	1	
269	5	9	4	13	12	5	17	12	6	18	13	6	19	269	6	8
270	1	1	1	2	1	1	2	1	1	2	1	1	2	270	0	
270	2	50	0	50	63	0	63	67	0	67	71	0	71	270	21	
270	3	3	0	3	4	0	4	4	0	4	4	0	4	270	1	
270	5	1	1	2	1	1	2	1	1	2	1	1	2	270	0	22
276	1	35	0	35	41	0	41	44	0	44	47	0	47	276	12	
276	5	1	3	4	1	4	5	1	4	5	1	4	5	276	1	13
278	1	27	2	29	30	2	32	31	2	33	34	3	37	279	8	
279	2	4	0	4	5	0	5	5	0	5	5	0	5	279	1	
279	3	15	6	21	17	7	24	18	7	25	20	8	28	279	7	
279	5	92	49	141	107	57	164	115	61	176	124	66	190	279	49	65
280	1	23	7	30	25	8	33	25	8	33	26	8	34	280	4	
280	2	2	1	3	2	1	3	2	1	3	3	1	4	280	1	
280	5	24	8	33	35	13	48	37	14	51	40	14	54	280	21	26
285	1	5	0	5	7	0	7	7	0	7	7	0	7	285	2	
285	5	5	3	8	7	4	11	7	4	11	8	5	13	285	5	7
286	1	132	3	135	143	3	146	151	3	154	160	4	164	286	29	
286	2	35	0	35	43	0	43	46	0	46	50	0	50	286	15	
286	3	2	3	5	2	3	5	2	4	6	3	4	7	286	2	
286	4	3	1	4	3	1	4	4	1	5	4	1	5	286	1	
286	5	21	7	28	24	8	32	26	9	35	28	9	37	286	9	56
287	1	75	29	104	82	32	114	87	33	120	91	35	126	287	22	
287	2	79	4	83	88	4	102	106	5	111	112	5	117	287	34	
287	3	8	1	9	8	1	10	10	1	11	10	1	11	287	2	
287	4	11	1	12	12	1	13	13	1	14	14	1	15	287	3	
287	5	21	14	35	24	16	40	26	17	43	28	18	46	287	11	72
288	3	4	1	5	5	1	6	5	1	6	6	1	7	288	2	
288	5	6	7	13	8	9	17	8	10	18	9	10	18	288	6	8
290	3	4	0	4	6	0	6	6	0	6	6	0	6	290	2	
290	5	43	7	50	51	10	61	56	10	66	60	11	71	290	21	23
292	1	105	10	115	115	11	126	121	12	133	128	12	140	292	25	
292	5	1	0	1	1	0	1	1	0	1	1	0	1	292	0	25
293	1	6	0	6	7	0	7	8	0	8	8	0	8	293	2	
293	2	22	0	22	28	0	28	31	0	31	33	0	33	293	11	
293	5	8	4	12	10	5	15	10	5	15	11	6	17	293	5	18
295	2	3	0	3	7	0	7	7	0	7	7	0	7	295	4	4
296	1	2793	65	2858	2986	70	3056	3158	74	3232	3341	78	3419	296	561	
296	2	8	2	10	10	2	12	11	2	13	11	2	13	296	3	
296	4	4	0	4	4	0	4	5	0	5	5	0	5	296	1	
296	5	4	1	5	4	1	5	5	1	6	5	1	6	296	1	566
297	1	25	19	44	27	21	48	28	22	51	30	23	53	297	9	
297	2	18	6	25	22	7	28	23	7	30	25	8	33	297	8	
297	3	3	1	4	3	1	4	4	1	5	4	1	5	297	1	
297	5	71	6	77	81	7	88	87	7	94	94	8	102	297	25	43
298	1	59	9	68	61	8	68	61	8	69	64	8	72	298	4	
298	2	6	2	8	7	2	9	7	2	9	8	3	11	298	3	
298	3	35	6	41	39	7	46	41	7	48	45	8	53	298	12	
298	4	22	4	26	25	4	28	26	5	31	28	5	33	298	7	
298	5	20	7	27	23	8	31	24	8	32	26	9	35	298	8	34
299	1	25	8	33	27	9	36	29	9	38	31	10	41	299	8	
299	2	20	10	30	23	11	34	24	12	36	26	13	39	299	9	
299	3	54	11	65	60	12	72	64	13	77	68	14	83	299	18	
299	4	13	0	13	15	0	15	15	0	15	17	0	17	299	4	
299	5	52	17	69	59	19	78	64	21	85	69	22	91	299	22	61
300	1	90	12	102	97	13	110	102	14	116	108	14	122	300	20	
300	2	145	91	236	169	102	271	181	109	290	193	117	310	300	74	
300	3	68	47	115	76	52	128	81	56	137	87	60	147	300	32	
300	4	34	2	36	38	2	40	41	2	43	43	3	46	300	10	
300	5	38	11	48	43	12	55	46	13	59	50	15	65	300	16	152
301	1	41	9	50	45	10	55	48	11	59	51	12	63	301	13	
301	2	46	1	47	57	1	58	61	1	62	66	1	67	301	20	
301	3	26	26	52	29	29	58	31	31	62	33	33	66	301	14	
301	4	39	5	44	44	6	50	47	6	53	50	6	56	301	12	
301	5	28	135	163	32	154	186	34	166	200	37	179	216	301	53	112
302	1	1556	7	1563	1662	7	1669	1755	9	1764	1854	9	1863	302	300	
302	2	54	8	62	64	9	73	68	10	78	73	10	83	302	21	
302	3	28	42	70	31	46	77	33	50	83	35	53	88	302	18	
302	4	33	13	46	36	14	50	39	15	54	42	16	58	302	12	
302	5	67	48	115	75	54	129	81	58	139	88	63	151	302	36	387
303	1	704	35	739	756	38	794	801	40	841	847	42	889	303	150	
303	2	68	3	71	85	4	89	91	4	95	97	4	101	303	30	
303	4	4	2	6	4	2	6	5	2	7	5	3	8	303	2	
303	5	21	8	28	24	9	33	25	10	35	27	10	37	303	8	190
304	1	1208	52	1260	1295	55	1350	1367	58	1425	1444	62	1506	304	246	
304	2	8	6	14	9	7	16	10	7	17	10	8	18	304	4	
304	3	44	21	65	49	23	72	52	25	77	56	27	83	304	18	
304	4	41	2	43	45	2	47	48	2	50	52	3	55	304	12	
304	5	52	22	74	59	25	84	63	27	80	68	29	97	304	23	303
305	1	8	2	10	8	2	11	10	2	12	10	3	13	305	3	
305	2	73	60	133	83	68	151	88	73	161	84	78	172	305	39	
305	3	46	69	115	52	77	129	55	83	138	59	88	147	305	32	
305	4	57	0	57	64	0	64	68	0	68	73	0	73	305	16	
305	5	82	26	108	93	30	123	101	32	133	108	34	142	305	34	124
306	4	2	0	2	2	0	2	2	0	2	3	0	3	306	1	
306	5	277	21	298	313	24	337	337	26	363	364	28	392	306	94	95
312	1	300	0	300	326	0	326	343	0	343	362	0	362	312	62	
312	2	80	0	80	102	0	102	109	0	109	116	0	116	312	36	98
313	1	4	4	8	4	4	8	4	4	8	4	4	8	313	0	
313	2	23	17	40	30	22	52	31	24	55	34	25	59	313	19	
313	4	1	0	1	1	0	1	1	0	1	1	0	1	313	0	
313	5	2	2	4	2	2	4	3	3	6	3	3	6	313	2	21
314	3	6	5	11	8	7	15	8	7	15	9	7	16	314	5	
314	5	3	1	4	6	1	7	6	1	7	6	2	8	314	4	9
317	1	182	48	230	200	53	253	214	56	270	227	60	287	317	57	
317	2	230	6	236	289	8	297	310	8	318	332	9	341	317	105	
317	3	20	6	26	17	5	22	18	5	23	19	6	25	317	-1	
317	4	43	0	43	48	0	48	51	0	51	55	0	55	317	12	
317	5	129	61	190	146	68	215	157	74	231	170	80	250	317	60	233
318	1	12	1	13	15	1	16	16	1	17	17	1	18	318	5	
318	2	4	2	6	5	2	7	5	3	8	6	3	9	318	3	
318	5	1	1	2	1	1	2	1	1	2	1	1	2	318	0	8
320	1	54	11	65	64	13	77	67	13	80	72	14	86	320	21	21
321	1	30	10	40	314	46	360	317	46	363	320	47	367	321	327	7
321	2	1	0	1	1	0	1	1	0	1	1	0	1	321	0	
321	3	3	0	3	3	0	3	4	0	4	4	0	4	321	1	
321	5	5	4	9	8	7	15	8	7	15	8	7	15	321	6	334
323	1	193	17	210	955	105	1060	1001	110	1111	1050	117	1167	323	957	
323	2	380	45	425	475	55	530	509	59	568	545	64	609	323	184	
323	4	2	2	4	2	2	4	2	2	4	3	3	6	323	2	1143
324	5	10	7	17	18	13	31	19	13	32	20	14	34	324	17	17
330	2	1	2	3	2	4	6	2	4	6	2	4	6	330	3	
330	5	126	1	127	148	3	151	159	3	162	170	3	173	330	46	49

APPENDIX B - EMPLOYMENT ESTIMATES & PROJECTIONS BY TAZ

TAZ	BUSINESS GROUP	1991 FULL	PART	TOTAL	2000 FULL	PART	TOTAL	2010 FULL	PART	TOTAL	2020 FULL	PART	TOTAL	TAZ	1991-2020 NET CHANGE	TOTAL BY TAZ
340	1	443	12	455	487	13	500	519	14	533	553	15	568	340	113	
340	2	97	44	141	113	50	163	120	53	173	128	57	185	340	44	
340	3	38	13	51	42	14	56	45	15	60	48	16	64	340	13	
340	4	30	4	34	33	4	37	36	5	41	38	5	43	340	9	
340	5	83	32	115	94	36	130	101	39	140	109	42	151	340	36	215
341	4	2	1	3	3	1	4	3	1	4	3	2	5	341	2	
341	5	222	17	239	257	22	279	279	24	303	300	26	326	341	87	89
346	1	15	0	15	16	0	16	15	0	15	15	0	15	346	0	
346	2	1	3	4	1	4	5	1	4	5	1	4	5	346	1	
346	5	2	1	3	4	1	5	4	1	5	5	2	7	346	4	5
350	1	14	0	14	16	0	16	17	0	17	18	0	18	350	4	
350	2	3	2	5	4	2	6	4	3	7	4	3	7	350	2	
350	3	5	0	5	6	0	6	6	0	6	7	0	7	350	2	
350	5	6	0	6	7	0	7	8	0	8	9	0	9	350	3	11
351	1	316	36	352	345	40	385	364	43	407	386	46	432	351	80	
351	2	13	3	16	15	3	18	16	4	20	17	4	21	351	5	
351	3	30	4	34	34	4	38	36	5	41	38	5	43	351	9	
351	5	21	1	22	24	1	25	26	1	27	28	1	29	351	7	101
352	1	50	3	53	56	3	59	59	4	63	63	4	67	352	14	
352	2	17	1	18	19	1	20	21	1	22	22	1	23	352	5	
352	3	101	31	132	114	35	149	121	37	158	130	40	170	352	38	
352	4	6	6	12	7	7	14	7	7	14	8	8	16	352	4	
352	5	93	20	113	107	23	130	115	25	140	124	27	151	352	38	99
353	1	0	1	1	0	2	2	0	2	2	0	2	2	353	1	
353	2	2	0	2	4	0	4	5	0	5	5	0	5	353	3	4

SOURCE: Land-of-Sky Regional Council

APPENDIX C - TRANSIT PROPENSITY RATINGS PAGE 1/1

TAZ	2000 TRANSIT PROPENSITY RATING	2010 TRANSIT PROPENSITY RATING	2020 TRANSIT PROPENSITY RATING
1	2	2	2
2	1	2	2
3	0	0	1
4	0	0	1
5	0	0	1
6	0	0	1
7	0	0	1
8	0	2	3
9	4	4	4
10	0	0	1
11	0	0	0
12	1	1	1
13	3	4	4
14	0	1	1
15	4	4	4
16	4	4	4
17	5	5	5
18	4	3	3
19	1	1	2
20	4	4	4
21	5	5	5
22	4	4	4
23	5	5	5
24	5	5	5
25	4	5	5
26	0	0	0
27	5	5	5
28	3	3	3
29	3	3	3
30	3	3	3
31	3	3	3
32	2	2	2
33	3	3	3
34	4	4	4
35	3	4	4
36	3	3	3
37	1	1	2
38	1	1	2
39	1	1	1
40	0	0	0
41	0	0	0
42	0	0	0
43	0	0	0
44	0	0	0
45	0	2	2
46	0	1	1
47	0	0	0
48	0	0	0
49	0	1	2
50	1	1	2
51	1	1	2
52	0	1	2
53	0	0	0
54	0	0	0
55	0	0	0
56	1	2	2
57	1	1	1
58	1	1	1
59	1	2	2
60	1	1	2
61	1	1	1
62	1	1	1
63	0	0	0
64	0	1	1
65	0	1	1
66	0	2	2
67	3	3	3
68	1	1	1
69	1	2	2
70	1	2	2
71	0	1	1
72	0	0	0
73	0	1	1
74	0	0	0
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79	2	2	3
80	0	0	1
81	2	3	3
82	2	2	3
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86	2	3	2
87	0	0	0
88	0	0	0
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91	0	0	1
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93	1	2	3
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95	0	0	0
96	0	0	0
97	0	0	2
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99	0	0	1
100	3	3	3
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102	2	2	2
103	3	3	3
104	2	2	2
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106	3	3	4
107	0	1	1
108	0	2	2
109	1	2	2
110	2	2	2
111	1	2	2
112	2	2	2
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114	0	0	0
115	1	1	1
116	2	2	3
117	0	0	0
118	0	0	0
119	3	3	3
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121	0	0	0
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123	3	3	3
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128	2	2	2
129	1	1	2
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132	0	0	0
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135	0	0	0
136	2	2	2
137	0	0	0
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139	1	1	1
140	0	1	2
141	0	1	1
142	0	0	0
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144	3	3	3
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146	1	1	1
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149	3	3	3
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151	0	0	0
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193	1	1	2
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195	0	0	0
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234	1	1	1
235	4	4	4
236	0	0	0
237	1	1	1
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239	1	1	2
240	3	3	3
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245	0	1	1
246	1	2	2
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249	2	2	2
250	1	2	2
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255	1	3	3
256	0	2	2
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258	0	1	1
259	0	1	1
260	1	2	2
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299	0	0	0
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301	0	1	1
302	0	2	2
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351	0	0	0
352	0	0	0
353	0	0	0

D. Capacity Analysis

A good indication of the adequacy of the existing major street system is a comparison of the traffic volumes with the ability of the streets to move traffic freely at a desirable speed. The ability of a street to move traffic freely, safely, and efficiently with a minimum delay is controlled principally by the spacing of major devices utilized. Thus, the ability of a street to move traffic can be increased by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering techniques.

Capacity is defined as the maximum number of vehicles that have a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given period under prevailing roadway and traffic conditions.[1] The relationship of traffic volumes to the capacity of the roadway will determine the **level of service** being provided. Six levels of service have been selected to identify the conditions existing under various speed and volume conditions on a highway or street.

The six levels of service are illustrated in Figure D1, and they are defined on the following page. The definitions are general and conceptual in nature, but may be applied to urban arterial levels of service. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them. Each chapter of the 1994 Highway Capacity Manual contains more detailed descriptions of the levels of service as defined for each facility type.

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[1] Highway Capacity manual, Special Report 209, 1994, p. 3:7-11.

1. **Level-of-service A** describes primarily free flow operations at average travel speeds, usually about 90 percent of the free flow speed for the arterial class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Stopped delay at signalized intersections is minimal.

2. **Level-of-service B** represents reasonable unimpeded operations at average travel speeds, usually about 70 percent of the free flow speed for the arterial class. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tension.

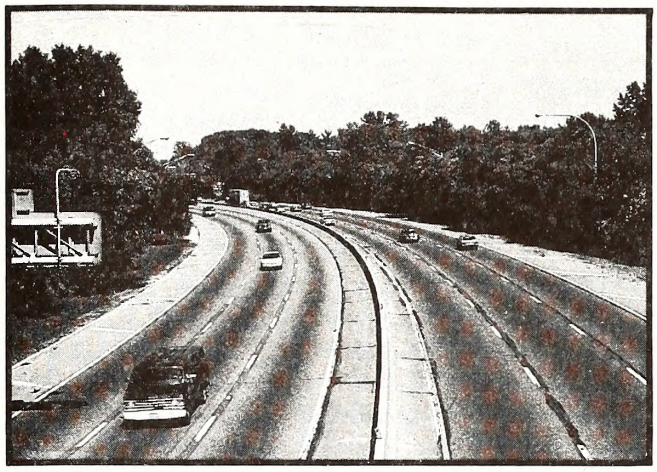
3. **Level-of-service C** represents stable operations. However, ability to maneuver and change lanes in midblock locations may be more restricted than in LOS B, and longer queues and/or adverse signal coordinations may contribute to lower average travel speeds of about 50 percent of the average free flow speed for the arterial class. Motorists will experience an appreciable tension while driving.

4. **Level-of-service D** borders on a range on which small increases in flow may cause substantial increases in approach delay and, hence, decreases in arterial speed. They may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these. Average travel speeds are about 40 percent of free flow speed.

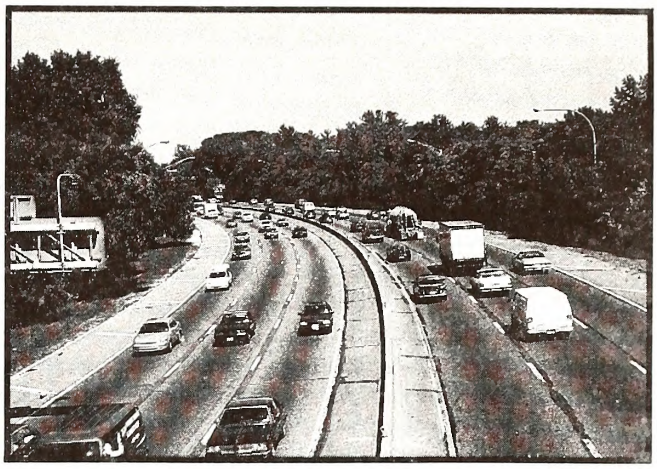
5. **Level-of-service E** is characterized by significant approach delays and average travel speeds of one-third the free flow speed or lower. Such operations are caused by some combination of adverse progression, high signal density, extensive queuing at critical intersections, and inappropriate signal timing.

6. **Level-of-service F** characterizes arterial flow at extremely low speeds below one-third to one-quarter of the free flow speed. Intersection congestion is likely at critical signalized locations, with high approach delays resulting. Adverse progression is frequently a contributor to this condition.

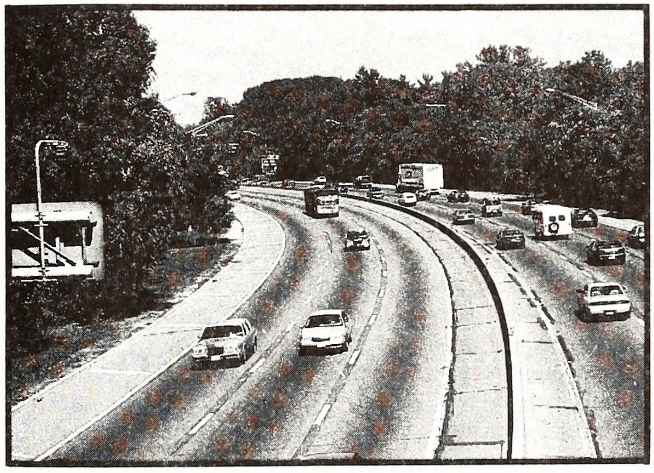
Source: 1994 Highway Capacity Manual



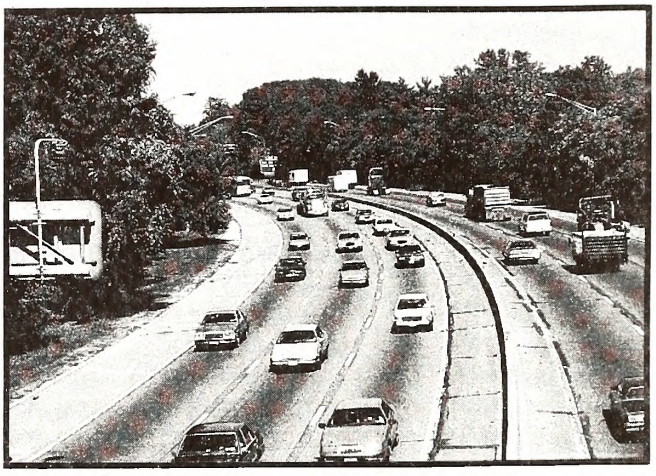
LOS A.



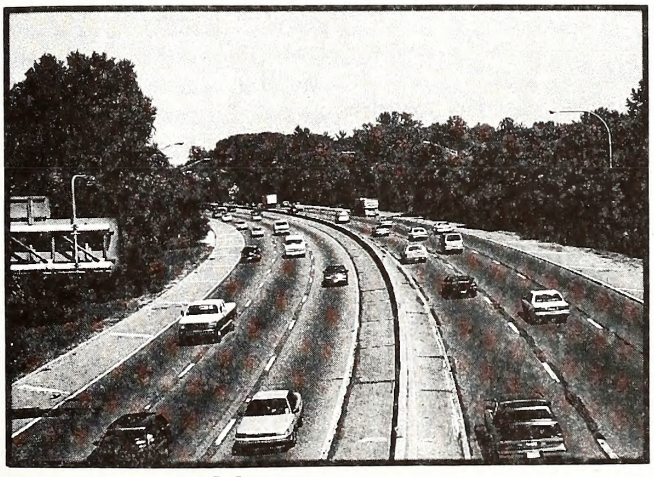
LOS D.



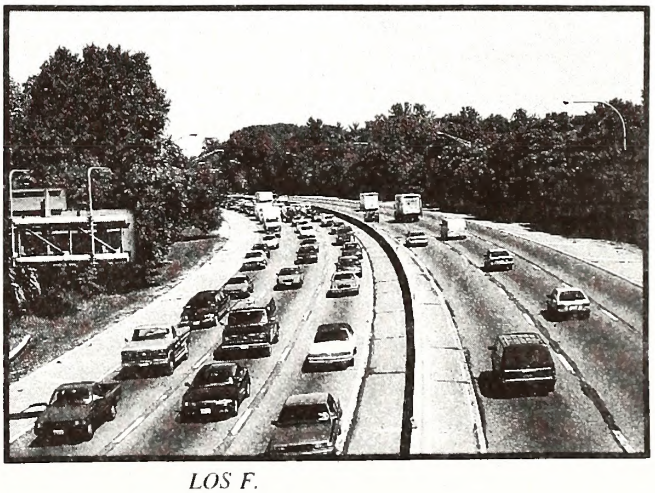
LOS B.



LOS E.



LOS C.



LOS F.

LEVELS OF SERVICE **FIGURE D1**

E. DESIGN REQUIREMENTS

SPECIAL NOTE: English equivalents are printed in this report merely as a guide. The English measurements were not meant to represent exact conversions, and should not be used for standards, regulations, or construction. The tables in this section were taken from the Roadway Design Metric Design Manual. In the event of conflicting information, the Standard Specifications for Roads and Structures and the Roadway Design Metric Design Manual should serve as the standard.

THOROUGHFARE CROSS SECTIONS

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Typical cross section recommendations are shown in Figure E1. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections could be developed that meet the needs of the project.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way. The recommended typical cross sections for the thoroughfares are given in Appendix A along with other pertinent information.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each of the thoroughfares are listed in Appendix A. Recommendations for "ultimate" cross sections are provided for (1) thoroughfares which may require widening after the current planning period; (2) for thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient; and (3) for thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to maximum and minimum grades, minimum sight distances, maximum degree of curve and related super elevation, and other considerations for thoroughfares are given later in this Appendix. This Appendix gives definitions and design standards recommended for inclusion in subdivision regulations.

Cross sections "A", "B", and "M" is typical for controlled access freeways. The 14 m (46 ft) grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 70 m (228 ft) depending upon cut and fill requirements.

Cross section "C", seven lane curb and gutter, should not be used for new projects. When the conditions warrant six lanes, cross section "E" should be recommended. Cross section "C" should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "E" is the final cross section.

Cross section "D", five lane curb and gutter, is typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "E", "F", and "N" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections. The 4.9 m (16 ft) median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians may be used in urban areas. However, these types of medians result in greatly increased maintenance costs and an increased danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

Cross section "G" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 7.3 m (24 ft) is recommended with 9.1 m (30 ft) being desirable.

Cross section "H" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required **at** major

intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require **cross section "I". Cross sections "J" and "K"** are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. **Cross section "J"** would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

Cross section "J" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 30 m (100 ft) should be required. In some instances, local ordinances may not allow the full 30 m (100 ft). In those cases, 21 m (70 ft) should be preserved with the understanding that the full 30 m (100 ft) will be preserved by use of building setbacks and future street line ordinances.

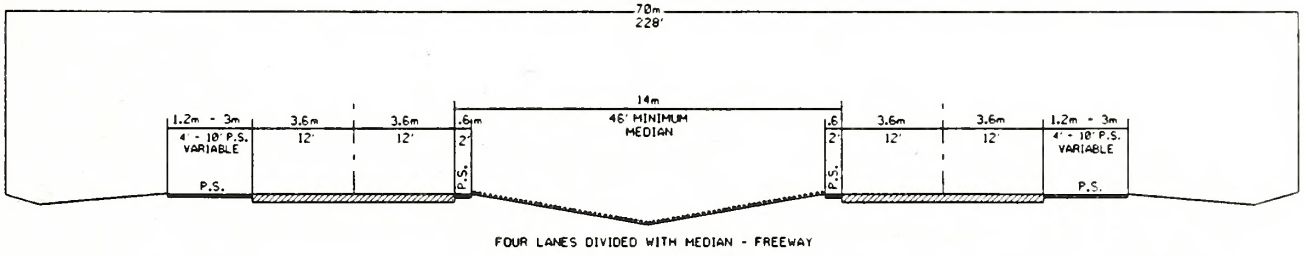
The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-ways shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. **Cross sections O, P, and Q** are typically used to accommodate bicycle travel.

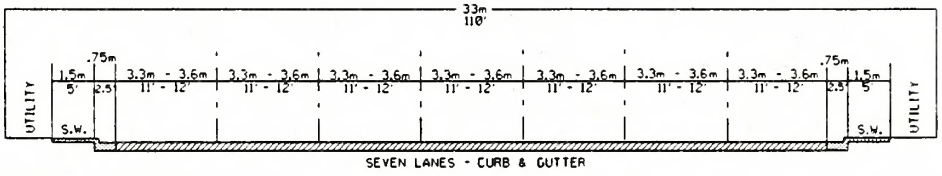
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



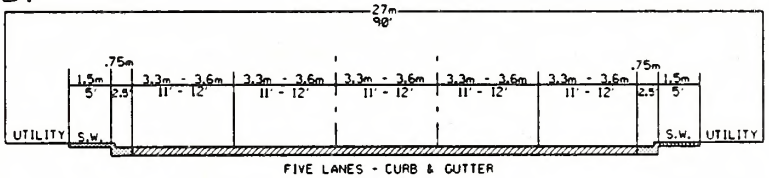
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

C.



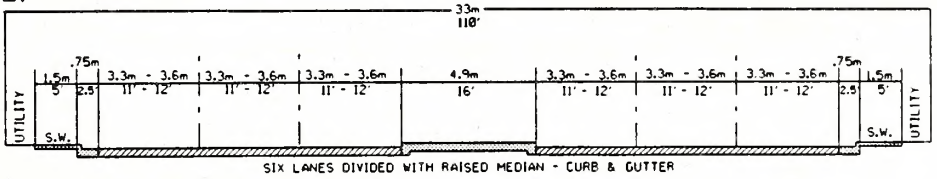
SEVEN LANES - CURB & GUTTER

D.



FIVE LANES - CURB & GUTTER

E.

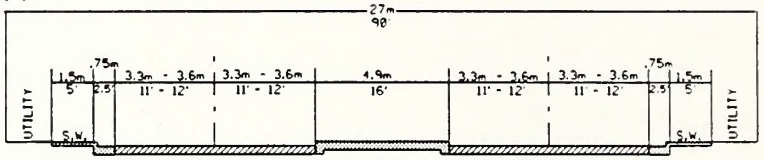


SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

FIGURE E1

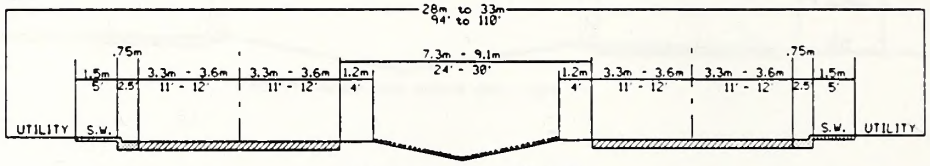
TYPICAL THOROUGHFARE CROSS SECTIONS

F.



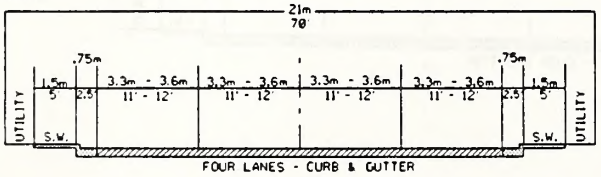
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

G.



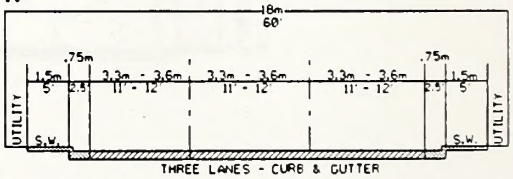
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

H.



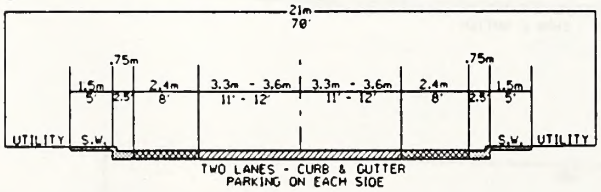
FOUR LANES - CURB & GUTTER

I.



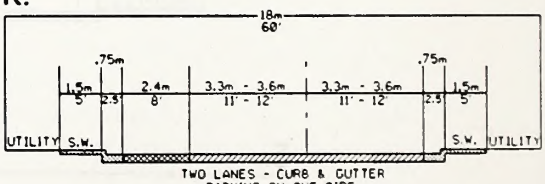
THREE LANES - CURB & GUTTER

J.



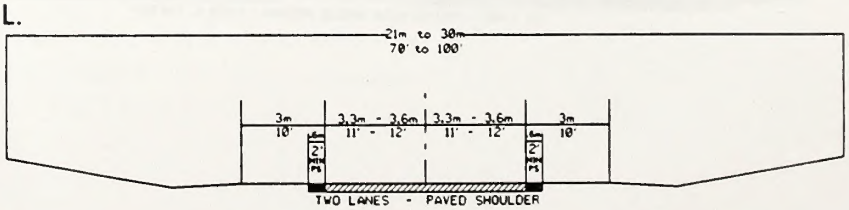
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

K.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

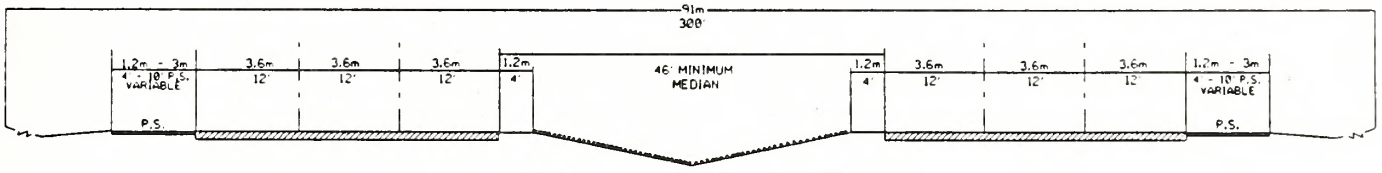
L.



TWO LANES - PAVED SHOULDER

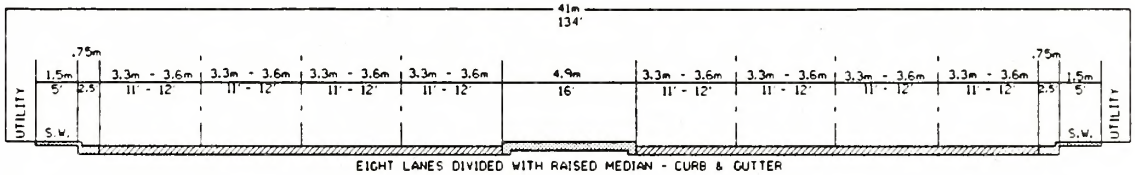
TYPICAL THOROUGHFARE CROSS SECTIONS

M.



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

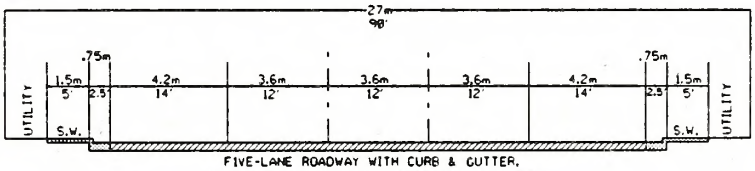
N.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

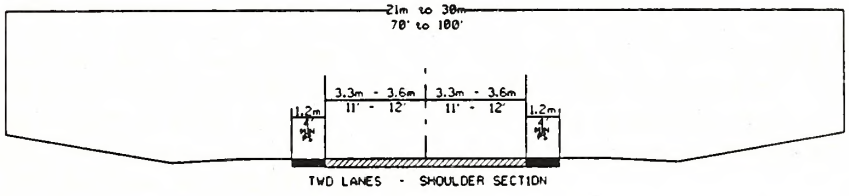
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

O.



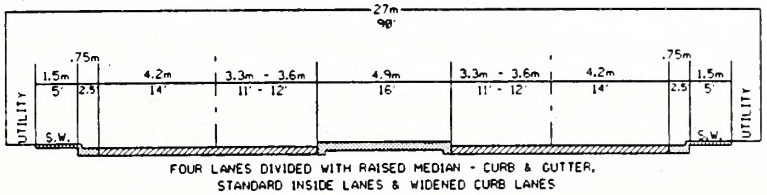
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

P.



TWO LANES - SHOULDER SECTION

Q.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

SUBDIVISION ORDINANCES

I. Streets and Roads

A. Rural Roads

1. Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.

4. Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.

5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Inter-state, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.

3. Local Street - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multilane roadways designed to carry large volumes of traffic

at high speeds. A freeway provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An expressway is a facility with full or partial control of access and generally with grade separations at major intersections. A parkway is for non-commercial traffic, with full or partial control of access.

2. Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. Local Residential Street - Cul-de-sacs, loop streets less than 760 meters (2500 ft) in length, or streets less than 1.6 kilometers (1.0 miles) in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

5. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides of develops any land

deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than 4 hectares (10 acres) where no street right-of-way dedication is involved, (3) the public acquisition, by purchase, of strips of land for the widening or the opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than 0.8 hectares (2 acres) into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

DESIGN STANDARDS

I. Streets and Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the municipality.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

		Min. ROW	
1.	Rural		
	a. Principle Arterial		
	Freeways	105 m	(350 ft)
	Other	60 m	(200 ft)
	b. Minor Arterial	30 m	(100 ft)
	c. Major Collector	30 m	(100 ft)
	d. Minor Collector	24 m	(80 ft)
	e. Local Road	18 m[1]	(60 ft)
2.	Urban		
	a. Major Thoroughfare other than Freeway and Expressway	27 m	(90 ft)
	b. Minor Thoroughfare	21 m	(70 ft)
	c. Local Street	18 m[1]	(60 ft)
	d. Cul-de-sac	Variable[2]	

The subdivider will only be required to dedicate a maximum of 30 meters (100 ft) of right-of-way. In cases where over 30 meters (100 ft) of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 30 meters (100 ft). On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than 18 meters (60 ft) in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to

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[1] The desirable minimum right-of-way (ROW) is 18 meters (60 ft). If curb and gutter is provided, 15 meters (50 ft) of ROW is adequate on local residential streets.

[2] The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths - Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential
   Curb and Gutter section: 7.8 meters (26 ft), face to face of curb
   Shoulder section: 6.0 meters (20 ft) to edge of pavement, 1.2 meters (4 ft) for shoulders

2. Residential Collector
   Curb and Gutter section: 10.2 meters (34 ft), face to face of curb
   Shoulder section: 6.0 meters (20 ft) to edge of pavement, 1.8 meters (6 ft) for shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed - The design speed for a roadway should be a minimum of 10 km/h (5 mph) greater than the posted speed limit. The design speeds for subdivision type streets shall be:

DESIGN SPEEDS (METRIC)			
Facility Type	Design Speed km/h Desirable	Minimum Level	Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	100	80	60
Local roads including Residential Collectors and Local Residential (ADT Over 400)	80	80	60
URBAN			
Major Thoroughfares other than Freeway or Expressway	100	60	60
Minor Thoroughfares	100	50	50
Local Streets	50	50	30

DESIGN SPEEDS (ENGLISH)			
Facility Type	Design Speed mph Desirable	Minimum Level	Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	60	50	40
Local roads including Residential Collectors and Local Residential (ADT Over 400)	50	* 50	* 40
URBAN			
Major Thoroughfares other than Freeway or Expressway	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

* Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce min design speed.

**Based on projected ADT of 50-250.
(Reference NCDOT Roadway Design Manual page 1-1B)

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

MAXIMUM VERTICAL GRADE (METRIC)				
Facility Type	Design Speed (km/h)	Maximum Grade (Percent) Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads*	30	7	10	12
	50	7	9	10
	65	7	8	10
	80	6	7	9
	100	5	6	8
	110	4	5	6
Local roads including Residential Collectors and Local Residential Streets*	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-
URBAN				
Major Thoroughfares other than Freeway or Expressway	50	8	9	11
	65	7	8	10
	80	6	7	9
	100	5	6	8
Minor Thoroughfares*	30	9	12	14
	50	9	11	12
	65	9	10	12
	80	7	8	10
	100	6	7	9
	110	5	6	7
Local Streets*	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-

* For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table.

(Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

MAXIMUM VERTICAL GRADE (ENGLISH)				
Facility Type	Design Speed (mph)	Maximum Grade (Percent) Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads*	20	7	10	12
	30	7	9	10
	40	7	8	10
	50	6	7	9
	60	5	6	8
	70	4	5	6
Local roads including Residential Collectors and Local Residential Streets*	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-
URBAN				
Major Thoroughfares other than Freeway or Expressway	30	8	9	11
	40	7	8	10
	50	6	7	9
	60	5	6	8
Minor Thoroughfares*	20	9	12	14
	30	9	11	12
	40	9	10	12
	50	7	8	10
	60	6	7	9
	70	5	6	7
Local Streets*	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-

b. Minimum grade should not be less than 0.5% .

c. Grades for 30 meters (100 ft) each way from intersections (measured from edge of pavement) should not exceed 5%.

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* For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table.

(Reference NCDOT Roadway Design Manual page 1-12 T-3)

3. Minimum Sight Distance - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters:

SIGHT DISTANCE (METRIC)					
Design Speed (km/h)	30	50	60	90	100
Stopping Sight Distance					
Minimum (meters)	29.6	57.4	74.3	131.2	157.0
Desirable (meters)	30	70	90	170	210
Minimum K* Value for:					
Crest curve	3	9	14	43	62
Sag curve	4	11	15	30	37
Passing Sight Distance:					
Minimum Passing Dist for two lanes, in m	*	*	*	*	*

(General practice calls for vertical curves to be multiples of 10 m. Calculated lengths shall be rounded up in each case.)

* Currently under revision.
(Reference NCDOT Roadway Metric Design Manual page 1-12 T-1)

SIGHT DISTANCE (ENGLISH)				
Design Speed, MPH	30	40	50	60
Stopping Sight Distance:				
Minimum (ft.)	200	275	400	525
Desirable (ft.)	200	325	475	650
Minimum K* Value for:				
Crest Curve	30	60	110	190
Sag Curve	40	60	90	120
Passing Sight Distance:				
Minimum Passing Distance for 2 lanes, in feet	1,100	1,500	1,800	2,100

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)
(Reference NCDOT Roadway Design Manual page 1-12 T-1)

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* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

4. The "Superelevation Table" shown below shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

SUPERELEVATION TABLE (METRIC)		
Design Speed	Maximum e*	Minimum Radius m
50 km/h	0.04	100
65	0.04	175
80	0.04	280
100	0.04	490
50	0.06	90
65	0.06	160
80	0.06	250
100	0.06	435
50	0.08	80
65	0.08	145
80	0.08	230
100	0.08	395

e = rate of roadway superelevation, meter per meter

SUPERELEVATION TABLE (ENGLISH)			
Design Speed	Maximum e*	Minimum Radius ft.	Max. Deg. of Curve
30 mph	0.04	302	19 00′
40	0.04	573	10 00′
50	0.04	955	6 00′
60	0.04	1,637	3 45′
30	0.06	273	21 00′
40	0.06	521	11 15′
50	0.06	955	6 45
60	0.06	1,432	4 15′
30	0.08	260	22 45′
40	0.08	477	12 15′
50	0.08	819	7 30′
60	0.08	1,146	4 45′

* e = rate of roadway superelevation, foot per foot
(Reference NCDOT Roadway Design Manual page 1-12 T-6 thru T-8)

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 60 meters (200 ft) between survey center lines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than 150 meters (500 ft) in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 6.0 meters (20 ft).

3. Dead end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead end as may be required by the Planning Board.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is

available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 9.0 meters (30 ft) from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 1.8 meters (6 ft) from the face of curb.

I. Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

a. Shoulder section approach

i. Under 800 ADT design year

Minimum 8.4 meters (28 ft) width face to face of parapets, rails, or pavement width plus 3.0 meters (10 ft), whichever is greater.

ii. 800 - 2000 ADT design year

Minimum 10.2 meters (34 ft) width face to face of parapets, rails, or pavement width plus 3.6 meters (12 ft), whichever is greater.

iii. Over 2000 ADT design year

Minimum width of 12 meters (40 ft), desirable width of 13.2 meters (44 ft) width face to face of parapets or rails.

b. Curb and gutter approach

i. Under 800 ADT design year

Minimum 7.2 meters (24 ft) face to face of curbs.

ii. Over 800 ADT design year

Width of approach pavement measured face to face of curbs.

Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 450 millimeters (1′ 6"), or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

   a. Shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (Shoulder width 2.4 m (8 ft) minimum, 3.0 m (10 ft) desirable.)

   b. Curb and gutter approach - Width of approach pavement measured face to face of curbs.